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Editorial Notes.

The Industry's Finances.

THE financial side of the industry is laid bare in Part II. of the Board of Trade Return relating to all Authorized Gas Undertakings in Great Britain, the issue of which for 1927 is noticed elsewhere in this number of the "JOURNAL." It is a plain, unvarnished tale, which reveals to the most casual observer how extensive are the claims of the industry to consideration at the hands of the Government. We find represented no fewer than 782 authorized undertakings, supplying so essential a commodity as gas to practically every community of any size in England, Scotland, and Wales, and having a total nominal capital invested of £183,405,321 (including loans borrowed by local authorities, and since repaid). These figures place gas high in importance among the great industries of the country, altogether without any consideration of the leading part which it plays in connection with many other industries upon which the nation depends. More than one-half of the total number of undertakings are in the hands of companies who have a combined paid-up capital, in shares and stock, amounting to £88,581,757, and loan capital issued (including debenture stock) of £26,135,262. The local authorities possess, as already mentioned, fewer undertakings; but they, too, have a large financial stake in the industry; for the total amount of money borrowed by them for their gas undertakings is £68,688,302—the amount of loans repaid and balance in sinking fund being £37,330,482.

These Board of Trade Returns are, of course, freely used for comparative purposes, and on the present occasion it is necessary to bear in mind that the figures, though in every case covering twelve months, embrace in each instance different periods. Thus, while the local authorities in England and Wales obtained a net profit of £1,570,918 during the year ended March 31, 1928, there was a deficit incurred by the Scottish local authorities of £1,125,524 in the twelve months ended May 15, 1927—the financial period to which the Return is made up. In the latter case the coal stoppage of 1926 was a strongly influencing factor. Deducting the Scottish deficit from the profit made in England and Wales, there is left a net profit for all local authority undertakings of only £445,394. The companies' figures are for the calendar year 1927, and they show a profit of £7,310,891. This is an increase when compared with the preceding year of £3,488,338, nearly all of which has resulted from reduced expenditure.

As has been pointed out, the Return furnishes financial details of the operations of authorized gas undertakings having a total nominal capital of £183,405,321 (including loans borrowed by local authorities, and since repaid), and one would search in vain for any sign of decay. So far from that being evident, progress is being made all along the line; but it is felt—and rightly felt—that this progress would be even more rapid were the industry free to expand without restraint. Such accelerated progress would be of benefit, not alone to the industry, but also to the millions of consumers, large and small, who depend upon it for one of the prime needs of civilized life.

A Check to the Ruhr High-Pressure Scheme.

A FEW weeks ago an esteemed German correspondent, for whose authority to write on German gas affairs we can vouch, gave in our columns an account of recent developments in the plans of the German Coal Syndicate to supersede the existing gas industry by a general supply of high-pressure gas from the Ruhr coke ovens. In this issue he keeps us up to date with the latest happenings; and those whose sympathy is with the "little man," as personified in the individual gas undertaking, against the all-devouring dragon of the Ruhr mains, will no doubt read his title with some misgiving. But a perusal of the article will reveal that the latest step towards general high-pressure distribution in Germany is that the little man has been able to make a very astute move, and call "check" on a highly important line of advance.

The story is well worth reading, as an excellent example of the general intrigue which at present centres round the gas supply of Germany. In brief, it is as follows: A large gas undertaking buys a colliery, in order to make itself independent of Ruhr supplies. The colliery is of necessity a member of the Coal Syndicate, and pays a fixed levy on all its sales into the pool. But colliery consumption and coal used by subsidiaries are exempt from all or part of the levy. So the gas undertaking divides itself into two—a manufacturing and a distributing concern. It presents to the colliery a 51 p.ct. shareholding in the manufacturing side, which therefore becomes a subsidiary of the colliery for purposes of levy-free coal. But this is not all. Present-day political opinion in Germany is strongly opposed to the owning of public utility services by private enterprise, and the State and provincial authorities own the highways where new mains are required. So they have to be won over by being given a holding in the new organization. Out of all this is evolved an example of what is known in Germany as group or regional gas supply. This is the counter-proposal of the gas industry to the Ruhr scheme. It advocates, in effect, a certain degree of centralization, and high-pressure dis-

tribution from the most economic and up-to-date works, while objecting, on innumerable grounds, to the fuel monopoly which the Ruhr scheme proposes.

The writer aptly reminds us that the Britisher was the pioneer of gas manufacture in Germany, but naturally, since 1914, our direct stake in German gas concerns has lapsed. But our interest in the industry is sustained by the very considerable quantities of gas coal which are still shipped to Germany from our north-east coast. Apart, therefore, from a desire to follow the developments from a technical point of view, and a natural sympathy for the sister industry in its struggle, we have a very good reason for wishing it success. For one of the main points advocated by the Ruhr Syndicate is that, under their scheme, English gas coal would be entirely cut out. In the Magdeburg-Dessau developments now described, they appear to have received a severe check. It must be remembered that, to be successful, the Ruhr scheme must embrace all the large centres of population, and must pay its own way, so to speak, by taking in profitable districts as it goes. The Syndicate last year secured the Hanover contract, and it is believed they made heavy sacrifices to get it, with the idea of pushing on *via* Magdeburg to Berlin. Evidently, therefore, all is not going for them according to plan; Magdeburg having now constituted itself the centre of a separate high-pressure supply system.

The author's remarks on the trend of modern gas-works practice in Germany towards carbonization in coke ovens are interesting. He regards this as very largely a speculation on the future of the iron industry, but it must not be forgotten that the domestic use of coke and other solid smokeless fuels is very highly developed in that country. The German gas industry is, indeed, at a highly interesting period of its history; and we would again remind our readers that the gas exhibition in Berlin this year will furnish an excellent opportunity of viewing affairs at first hand.

Koppers Vertical Chambers.

THE mind of the present-day gas engineer is mobile. Ultra-conservatism, with its narrow view of safety, has given place to a healthy encouragement of new plant and processes likely to lead to cheaper gas production. In fact, in no period of our industry's long and creditable history have new ideas been so enthusiastically received and considered, or new methods investigated with such commendable freedom from traditional hampering bias. It is a sign of the times that the Chapel, Whaley, and District Gas Company have installed continuous vertical chamber ovens, on the Koppers principle, as their gas-making system; and to them belongs the credit of being the first concern in this country to adopt this type of plant.

As yet it is too early to draw any definite conclusions of a comparative nature regarding the virtues of the Koppers vertical chamber oven plant which is described and illustrated fully in later columns of our issue to-day. The installation at Horwich End, Whaley Bridge, commenced gas-making only in June last, and a comprehensive economic statement regarding its working has not been put forward to date. We feel, however, that when this does appear, the figures will provide justification for the enterprise shown by the Board of the Chapel, Whaley, and District Gas Company. At present we are given the fact that 88 therms of 480 B.Th.U. gas represents the yield per ton of coal (a mixture of normal South Yorkshire and Derbyshire gas coal, containing 7 p.ct. of ash and 4 p.ct. of moisture) carbonized. At what cost these therms are obtained, we do not know; and for this reason we reserve judgment of the economics of the Koppers carbonizing system.

At the same time, many features of the plant appeal to us. Of these, the most impressive is the fact that the settings are heated by clean producer gas. This, we think, is a development which will be more appreciated when there is better realization of its effect in reducing the costs of replacements of refractory materials. What has prevented its steady adoption has been loss of efficiency in the heating of the settings, caused by dissipation of the sensible heat of the coke discharged from the retorts, and of the producer gas itself. With efficient heat regeneration—regeneration, not recuperation—such as is embodied in the Koppers chamber oven design, this loss is minimized, for both air and gas are preheated to a temperature of 1000° C. and over. Cold, clean producer gas implies avoidance of the damage to refractories caused by impingement of gases containing ferruginous dust and alkali; also, it allows of nicer control. In the Koppers plant at Whaley Bridge, the chambers are heated alternately from top to bottom and from bottom to top; the alternations being effected every half-hour. Both these factors—clean gas and accurate control—must prolong the life of the setting; and we have little doubt that the money so saved will more than offset the extra initial expense of the external producer. A further important feature of good control is that it renders the plant much more flexible than would otherwise be the case. In the article under review, it is stated that thermal efficiency is not impaired at a load even 50 p.ct. below the maximum. Against the high efficiency of regeneration, though, it is necessary to place the fact that steam is not generated from waste heat.

The major advantages of the Koppers system of continuous vertical chamber carbonization are set out clearly in the first part of the article. They include reduced labour charges; few fittings, and hence low maintenance; production of large and strong coke having only a small percentage of breeze (which is employed in the producer); small ground space necessary; effective heat insulation, and freedom from dust and fumes; and flexibility. The latter quality, it is suggested in the article, is enhanced by the provision of additional coal gas heating, if this, due to the state of the coke and bye-products market, is found desirable. We think, however, that this is more a "paper" advantage than one likely to be gained in practice. Further opinion regarding the Koppers plant is premature; it must be based on complete working results. These we hope to publish as soon as they are available.

Rating Tendencies.

AT a time when so much attention is being paid to questions of rating—or should we say de-rating?—particular interest attaches to the statistics which are compiled with unfailing regularity, and with such infinite pains, by Mr. W. Allison Davies, Borough Treasurer of Preston. His list of rates levied in various towns grows year by year, by the addition of fresh names, so that the forty-fourth issue, which is for the financial period 1928-29, offers a comprehensive indication of rating tendencies at the present time. The places included number nearly 300; there being 84 County Boroughs, 100 Boroughs, 84 Urban Districts, and 28 Metropolitan Boroughs. In their respective categories, the places are both large and small, both residential and industrial; and in each of the four sections into which the statistics are divided, it is gratifying to note a decrease in the actual average rates levied in the year 1928-29, when comparison is made with the preceding twelve months. This is particularly important at a time when the country is so heavily taxed as it is now.

It may be said that in the County Boroughs enumerated the average rates are 14s. 4¼d. in the pound, as compared with 14s. 8¾d. a year ago; while the Boroughs figure at 14s. 1¾d., as against 14s. 4¼d., and the Urban Districts at 15s. 5⅛d., against 15s. 9⅞d. The Metropolitan Boroughs display a practically unbroken list of declines, and in many instances the amounts in the pound by which ratepayers have benefited are quite substantial. Poplar, long to the fore in this respect, still heads the list of Metropolitan Boroughs with rates totalling 23s. 4d. in the pound, as compared with 25s. twelve months ago. It is, in fact, now the only place in London to pay more than 20s. Bermondsey, at 17s. 6d., is substantially better off this year; while Bethnal Green, with 17s., shows an enormous improvement, and Stepney, at 15s. 1d., is also much more

favourably situated than was the case in the previous return. The ratepayers in all these districts must feel devoutly thankful for the relief thus afforded them, though the amounts levied even now are heavier than one would wish to see them. Westminster, which was the only Metropolitan Borough in the last list with rates below 10s., has now been joined by Holborn, Kensington, and St. Marylebone.

Among the County Boroughs there are to be found seven towns that are rated below 10s., which compares with six a year ago; while six are over the 20s. mark, as against seven in the previous list. Merthyr Tydfil, at 29s., is not yet displaced from its position as the highest rated place among the County Boroughs, though it shows a decrease of 1s. 7½d., when compared with last year's figure. It is well beaten among the Urban Districts by Gellygaer, which last year overtook Merthyr Tydfil, with 32s. 4d., and has on this occasion left its previous record behind, with the stupendous figure of 34s. 11d. From Gellygaer to Oxford is a far flight; but some of the ratepayers of the former place must wish that they could undertake it, for Oxford is the most lightly-rated town in England and Wales, with a total that has declined from 7s. 7¾d. to 6s. 10½d. The other County Boroughs below 10s. are Blackpool, Bournemouth, Brighton, Darlington, Eastbourne, and Southport—five of them seaside places which possess many attractions in addition to their light rates. Among the Boroughs, Luton, Bexhill, and Tunbridge Wells are below 10s.; and in the list of Urban Districts, the same remark applies to Bebington, Epsom, Hendon, and Sutton (Surrey).

Of those places at the other end of the scale, no more need be said. Numerous circumstances combine to influence the amount of rates levied; and there are many districts which are severely handicapped as the result of adverse conditions. Very few manufacturing centres are included among the fortunate places just enumerated; and it is such areas that have stood principally in need of relief.

The Gas Fund.

The Board of Trade are continuing, for 1929, the rate of contribution to the Gas Fund at 1s. per million cubic feet of gas sold; the basis of calculation being the sales last year. The contribution should be paid on or before April 1.

The Holborn Explosion.

In later columns of our issue to-day we conclude our report of the first stage of the Home Office inquiry into the circumstances of the explosion which occurred in the Bloomsbury district of London on the morning of Dec. 20. It was the intention of the Commissioners (Mr. R. G. Hetherington, O.B.E., M.Inst.C.E., Deputy Chief Engineering Inspector under the Ministry of Health; Lieut.-Col. R. A. Thomas, C.B.E., one of H.M. Inspectors of Explosives; and Mr. E. H. Tabor, M.Inst.C.E., Assistant Chief Engineer to the London County Council) to sit daily until the inquiry was completed; but it became desirable to call a halt in the proceedings, in order that fuller information could be collated. Accordingly, on Thursday last, the inquiry was adjourned till Jan. 21. After the evidence of eye-witnesses had been taken on Monday, Dec. 31, and of Mr. Robert Sinclair, Chief Inspector of the Central External Section of the Post Office Engineering Department on Jan. 1, evidence was given by Mr. Stephen Lacey, B.Sc., Distribution Engineer of the Gas Light and Coke Company, on Wednesday last. Our report to-day is concerned chiefly with Mr. Lacey's evidence

Electrolysis of Gas Mains.

A remarkable photograph of a section of 6-in. main removed recently from the distribution system of the Glasgow Corporation Gas Department is published in to-day's "JOURNAL." A hole measuring 5 in. by 4 in. was melted out of the main by the action of a fused electric cable which had subsequently been laid across the gas main. The escape of gas resulted in the death of a woman who resided in adjoining property; and we call attention to the fact that employees of the Electricity Department of Glasgow had been engaged during the previous week in an attempt to locate a fault on their mains, and had reported that the fault had "righted itself." Gas, of course, received due attention at the hands of publicists, whereas the prime offender—electricity—"enjoyed" practically no Press comment. This is a bad, but by no means an isolated, case.

Railway Rates.

Alluding to the falling-off of earnings, as indicated by the weekly traffic returns for the four railway groups in Great Britain, "The Times" says there is authority for stating that the companies, "fully alive to the difficulties and dangers of the position, are not anxious for any change now in their charges in an upward direction. This is good news for the industries of the country; and it is doubtless a wise attitude from the point of view of the railways themselves. We look for broad-minded leadership to suggest a greater remedy than the threadbare one of raising charges to increase revenue. That is a policy which might have been of doubtful soundness even in monopolistic days, and is much more likely to be so now, when the cry is so frequently heard of "Back to the road!" It is to be hoped that the huge gross deficit will assume very different proportions when the economies effected during the year—which of course included a general reduction of wages—are placed against it; but in any case the sum must be a large one. Perhaps when the Railway Rates Tribunal come to review the situation, they will decide to defer for a further twelve months any alteration in the rates.

American Shopkeepers and Street Lighting.

In a report on the Seventh Meeting of the International Commission on Illumination, which took place in New York last September, Mr. J. F. Colquhoun, City Lighting Engineer, Sheffield, expresses the opinion that shopkeepers in America realize the attractiveness of good street lighting far more clearly than do the shopkeepers in our own country. Nor does their appreciation stop short at theoretical praise; they are willing to pay for ornate and expensive street lighting installations—the cost presumably being charged to their advertising account. In these cases—and it would appear that the arrangement is satisfactory to the shopkeepers, for the system is common in American cities—the first consideration in the choice of fittings is appearance; and the high degree of illumination is obtained by expenditure of electrical energy. An extract from Mr. Colquhoun's report appears in our issue of to-day. In almost all the American cities visited, he states, the street lighting is done by the local gas or electricity company, working under a contract with the city; "but there is no doubt that the British practice of the municipalities undertaking this work for themselves results in a much better service to the respective communities. There is a uniformity in the lighting of British cities which is lacking in America."

Institution of Chemical Engineers.—At a meeting on Friday, Jan. 18, at the Institution of Civil Engineers (6.30 p.m.), Prof. J. W. Cobb, C.B.E., B.Sc., F.I.C., will deliver a lecture on "The Reactivities of Solid Carbon in Fuel Processes." Sir Alexander Gibb will preside.

Increase of Gas Consumers in Canada.—The Annual Report of the Electricity and Gas Inspection Services for the fiscal year ended March 31 has been published under the auspices of the Department of Trade and Commerce, Ottawa. The increase in the number of gas meters tested was 13,488; and the number of meters in use on March 31, 1928, on manufactured gas was 482,433—an increase of 19,937 on the previous year. The report states that manufactured gas sales showed an increase of 725 million c.ft.

Wax Crayons from Coal Tar.—It is stated that the suitability of wax extract from low-temperature tar, for use as a base in the manufacture of coloured wax crayons, is being investigated at the Pittsburgh Experiment Station of the United States Bureau of Mines. Several commercial coloured crayons have been analyzed, and similar crayons have been made up using the tar wax. From experiments so far made, this wax appears to be well suited to the purpose. It has a high melting-point, which doubtless will render its use advantageous in making crayons for particular purposes.

PERSONAL.

The Board of Directors of Messrs. Glover & Main, Ltd., have accepted with regret the resignation of Mr. GLOVER CLARK, who has been a Director of the Company and the two allied Companies—Messrs. Thomas Glover & Co., Ltd., and Messrs. R. & A. Main, Ltd.—since 1920. Prior to his joining the Board of these Companies, Mr. Glover Clark represented Thomas Glover & Co., Ltd., for upwards of forty years. Mr. CORBETT W. WOODALL and Mr. SYDNEY E. WOOD have been elected Directors of Glover & Main, Ltd., and of the two allied Companies.

An interesting function took place at the Seacombe Ferry Hotel on Dec. 21, when the former Assistants of Mr. JOHN HENRY CROWTHER (who has recently retired from the position of Engineer and Manager of the Wallasey Gas and Water Department, after 37 years' service) dined together. The occasion was made the opportunity of showing the great regard and esteem in which Mr. Crowther is held, by the presentation to him of a handsome cabinet containing cut glass. Mr. Crowther, in acknowledging the gift, thanked them for their expression of goodwill towards him. The former Assistants associated with the presentation were: Mr. Reginald W. Edwards, Managing Director and Chairman of the Aldershot Gas, Water, and District Lighting Company; Mr. Henry J. Woodfine, Secretary and Manager of the Wellington (Salop) Gas Company; Mr. George E. Ashurst, F.C.I.S., Secretary of the Town of Dudley Gas Light Company; Mr. Charles Loveridge, Engineer and Manager to the Wolstanton (Staffs.) Gas Department; Mr. A. W. Bissell, Engineer and Manager to the Sowerby Bridge Gas Department; Mr. George Dixon, B.Eng., Assoc.M.Inst.C.E., Engineer and Manager to the Lancaster Corporation Gas Department; Mr. Thomas R. Cook, Engineer and Manager to the Rotherham Gas Department; and Mr. Edward Crowther, B.Sc., Deputy Engineer and Manager to the Bradford Corporation Gas Department.

OBITUARY.

HERBERT BUCKLEY.

His many friends in the Institution of Gas Engineers, and in the Southern Association of Gas Engineers and Managers—to all of whom he had endeared himself—will join with us in feelings of sincere regret at the news of the death of Mr. HERBERT BUCKLEY, which occurred at the King Edward VII. Hospital, Windsor, last Thursday.

It will be recalled that on Dec. 1 Mr. Buckley was engaged with a London electrician and two of the gas-works staff in testing a new apparatus for boosting the supply of gas from the works of the Windsor Royal Gaslight Company to the Eton area, when an explosion took place. All four were knocked down by the force of the explosion, and were burned about the face and hands. They were immediately taken to the King Edward VII. Hospital. The other three men completely recovered from their injuries, and were in due course discharged. Mr. Buckley, however, who was not so badly hurt as the electrician, appeared at first to be progressing satisfactorily; but a fortnight ago sepsis set in, which eventually spread from the face to the whole system. A prolonged fight with the disease was made, but, though Mr. Buckley was of strong physique and an excellent patient, he succumbed on Thursday morning last. The exact cause of the explosion has not been ascertained, and an inquest will have to be held.

After leaving school, deceased was first appointed on the staff of the Gas Department of the Leeds Corporation, and from there proceeded to the works of the Portsmouth Gas Company. In July, 1901, he was one of 75 applicants for the position of Works Manager to the Windsor Royal Gaslight Company, and subsequently received the appointment. He proved himself a very capable and efficient officer. That the Directors of the Company appreciated his work was shown by the fact that in the year 1926 he was appointed to a seat on the Board. He was extremely popular with the men who served under him.

The funeral took place at Windsor Cemetery on Saturday morning, and was numerously attended. The Vice-Chairman of the Company, Sir John Soundy; and Messrs. A. Harris and G. P. Cartland (Directors); the Assistant Engineer, Mr. J. G. Abbot; and the Secretary, Mr. W. E. Free, were present; together with a large number of the Company's employees. There were also noticed Mr. John Terrace, President of the Institution of Gas Engineers, and the Ex-Secretary, Mr. Walter T. Dunn. Mr. H. Wilkinson, Engineer of the Slough Works, represented the Southern Association of Gas Engineers and Managers. Among others seen were Mr. J. C. Wright, of Romford; Mr. A. W. Sumner, of Grays and Tilbury; Mr. W. S. Venner, of Brentwood; and Mr. A. E. Brooks, of Ascot.

On Jan. 1, Mr. WILLIAM GARSIDE PHILLIPS, J.P., Chairman of the Warwickhire Coalowners, and Vice-Chairman of the Nuneaton Gas Company, who had been seriously ill for several weeks, died at his residence, Ansley Hall, near Nuneaton. Deceased was born at Hyde (Cheshire) in 1849, being the son of a coal miner. At nine years of age he commenced work underground, and was in the habit of doing a thirteen-hour "shift," and then attending a night school and science classes. As a comparatively young man he obtained a mine manager's certificate. He came into Warwickshire in 1879, and assumed the management of Ansley Hall Colliery. When the Ansley Hall Coal and Iron Company, Ltd., was reconstructed, Mr. Phillips became Managing Director.

ON THE ELECTRICAL SIDE.

Domestic Supply Service at Wimbledon.

The Wimbledon Corporation Electricity Works cover a well-populated area; and those in charge of the undertaking would seem to have given special attention to the domestic supply service, with the result that plant extensions have had recently to be carried out. At the moment of writing there is before us the annual rating return, dealing with various towns throughout the country, which is compiled by Mr. W. Allison Davies (Borough Treasurer of Preston); and this gives the population of Wimbledon, according to the census of 1921, as 61,418. The estimated population at Midsummer, 1927, is put at 58,150. We do not know, of course, how closely these figures correspond with the number of persons to whom the supply of Wimbledon Corporation current is available; but they are of interest in considering some statistics which have been published by the "Electrical Review," which submits that "the results obtained are excellent for a comparatively small undertaking—especially when it is noted that the showroom and administrative costs relative to the domestic service amount to something like £100 for the capital outlay, and £400 per annum working expenses." According to the writer, during the first six months of 1928 the undertaking installed 240 cookers, 123 water heaters, 60 wash boilers, 340 irons, and 250 kettles. Already this heating season over 500 radiators have been fixed. The bulk of the apparatus is put out on hire. With the exception of lighting equipment, the department undertake to hire-out any obtainable class of domestic electrical apparatus. A considerable amount of hire-purchase business is also done; and well over 200 agreements for all sorts of appliances have been signed since March last.

For all services, flat rates are charged by the Corporation. For cooking and ordinary heating, the supply is charged for at 1d. and ¾d. per KW.H. for the winter and summer quarters respectively. Water heating is rated at ½d. per unit, and lighting at 3½d. per unit. There are at present thirteen different types of cookers handled by the Corporation. At the end of September last, 1897 cookers were connected to the mains. The average maintenance cost per cooker for the previous twelve months was 15s. 4d. For the previous year, the figure was 19s. 8d.; while for the year ended September, 1926, the amount spent per cooker was 21s. 9d. The drop is attributed, not to the increase in the number of cookers installed, but to the change-over which is being effected to closed-type boiling plates.

The latest development of the department is the equipping of 200 houses on a new estate at Malden. These are all electric, except for one coal fire. A 10-gallon water heater is installed in the bathroom, and a 1½-gallon heater is fixed in the kitchen as part of the cooker equipment.

Need of Hire-Purchase Schemes.

Some of the same points were touched upon by Mr. J. E. Tapper, of Beckenham, in a paper on the subject of hire and hire-purchase schemes, which he read at the recent Electrical Development Association Salesmanship Conference. Dealing with the necessity of hire-purchase schemes, he said that a man who bought a house more often than not left the question of electrical fittings to the last, and then found that he could hardly afford even those of the plainest possible type. In such cases—and they were legion—the only way to secure the business was by assistance from the supply authority. We are not at all inclined to find fault with this statement, but it seems a little unkind—to the purveyors of electrical apparatus, to the housebuilders, or to the inhabitants of Beckenham. Mr. Tapper is anxious to "temper the wind to the shorn lamb," but very rightly he does not wish to do so at the expense of his undertaking. Owing to the danger that, if no deposit, or only a small deposit, was asked for, the goods might be returned considerably the worse for wear after three or four months, when an insignificant amount had been paid for them,

Mr. Tapper said it was not his practice to enter into a hire-purchase agreement, but to deal with the transaction as a definite sale, allowing the consumer to pay by instalments over an agreed period. Under such a "deferred payment" system the authority could exercise discretion as to the acceptance of the return of goods, and it could refuse the return of badly used apparatus, and sue the purchaser for payment in full.

Electricity Board Schemes.

Referring to the progress that has been made with the preliminary work of organizing the various area electricity schemes into which Great Britain is to be divided, "The Times" states that the estimated capital expenditure of the four schemes already approved by the Central Electricity Board is £17,000,000, divided as follows: Central Scotland, £2,204,000; South-East England, £6,691,000; Central England, £3,600,000; North-West England and North Wales, £4,835,000. Of this amount, contracts placed to date represent a sum of £2,802,330, a proportion of which is in course of being spent. The Board came into existence in March, 1927, and the first scheme was approved in July of that year. In the interval the Board have had to undertake the long and tedious task of removing legal obstacles to the arranging of wayleaves for electrical supply routes and sites for new stations. Completion of the greater part of these formalities leaves the way clear for concentrating on the preparation of specifications for contracts in connection with machinery for electrical generation and distribution. Hence the coming year should witness a big step towards the practical realization of the four schemes, though the three in England are not likely to be completed during the year. The Mid-East England scheme for Yorkshire and Lincolnshire will, it is understood, shortly emerge from the stage of consultation and discussion, and may come before the Board for approval in the next few weeks.

Live Wire Risks with Aerials.

Three deaths which occurred recently in connection with two accidents should do much to warn people of the danger of live wires in proximity to wireless aerials. A proper appreciation of the risk would prevent the bringing of such aerials close to live wires, though under the best conditions a cable of this character must remain a potential source of harm. In each case it was the wireless set of a miner that brought about the tragedy; and in the first case the victim's wife, who was also killed, went to his assistance. One accident took place near Pontypridd, and the other in the neighbourhood of Mansfield. The circumstances were very similar—wireless poles were being erected, when the aerials came in contact with the overhead cables. At Pontypridd the Coroner's Jury added as a rider to their verdict that where live wires were in close proximity to a house, they should be insulated. In the Mansfield case, it was stated on behalf of the Sheepbridge Colliery Company that to each pole bearing the overhead cable was attached a permanent danger warning, and that safety guards were used where cables passed over roads. Evidently this is not sufficient to restrain the foolish; and it is necessary to neglect no opportunity of impressing upon them the nature of the risks they run in taking their aerials close to these live cables.

"An Advertisement for Gas."

According to the "Electrician," there has been a "terrible explosion of gas mains" in one of the densely populated areas of Central London. The reference, of course, is to the occurrence which is at present the subject of inquiry by a Home Office Commission; and our contemporary emphasizes the fact that until after the inquiry apportionment of blame is impossible. The writer cannot, however, refrain altogether from showing the lines along which his thoughts run; and he expresses himself as follows: "The advertisement which the gas industry has thus received cannot fail to have a good effect on the electrical industry, though, apart from such selfish considerations, it becomes increasingly obvious that, from a purely humanitarian point of view, serious consideration will have to be given to the conditions under which gas is distributed, and that distribution controlled, in crowded modern cities." This sentence may well be read in conjunction with the paragraph above referring to live wires.

GAS STOCK AND SHARE MARKET.

[For Stock and Share List, see later pages.]

THERE was a cheerful atmosphere on the Stock Exchange last week, and there were many strong features. Gilt-edged stocks, in spite of a slight set-back towards the close, were very prominent, especially the 5 p.ct. War Loan, which reached an unusually high figure. Other leading stocks also progressed, except Indian securities, influenced no doubt by the new £10,000,000 loan. At the time of writing the result of this issue is not known; but the feeling on the market is that it will be fully subscribed. On the Foreign Market, French, Brazilian, and Chinese loans were in demand; the latter being favourably influenced by the higher Customs receipts. Home Rails, by reason of the announcements of the road traffic arrangements, were a little more popular. There was quite a revival in the Industrial specialities, including Mond Nickels, Columbias, Imperial Tobaccos, and Courtaulds.

In the Gas Market business was good. There was a further rise of 15 points, to 210-220, in the Imperial Continental capital stock, the highest recorded transaction being at 219. As there is no apparent reason for the enormous increase that has occurred during the past few weeks, it will not be surprising if the "speculators" find themselves badly hit. Continental Union ordinary was marked up a further 7 points to 112-117; but the highest recorded transaction was only 2½ points up on the previous week. The consolidation powers of the Sheffield Company being now in force, the old "A," "B," and "C" stocks are now described as Consolidated Stock, with an increase of ½ point in the quotation to 104-106, in the local list. No change has yet been made on the London list. It will also be seen that the Metropolitan (of Melbourne) 5½ p.ct. redeemable debentures are now quoted in the Table.

The following transactions were recorded during the week:

On Monday, British 7 p.ct. pref. 113, Cardiff 7½ p.ct. deb. 102½, Continental Union 105, 106, 106½, 107, European 9¾, 9⅞, 10, Gas Light and Coke 18s. 3d., 18s. 6d., 3 p.ct. deb. 59, Imperial Continental 195, 197, 198, 199, 200, 200¾, Metropolitan (of Melbourne) 5½ p.ct. deb. 101, 101¼, Montevideo, 96½, 97, Newcastle 4 p.ct. pref. 74¼, Primitiva 26s. 3d., 26s. 4½d., 26s. 6d., 26s. 7½d., 26s. 9d., 26s. 10½d., 27s., South Metropolitan 107, 107½, 3 p.ct. deb. 60, Southampton 5 p.ct. max. 78⅞, Tuscan 22s. 6d.

On Wednesday, Aldershot 4 p.ct. pref. 71, Bournemouth 7 p.ct. max. 12⅝, British 116½, Cardiff 7½ p.ct. deb. 100, 100⅞, Continental Union 105, 105½, 106, 106½, 107, 107¼, 107½, European 9⅞, 9⅝, Gas Light and Coke 18s. 3d., 18s. 4½d., 18s. 6d., 18s. 7½d., 3½ p.ct. max. 63¾, 4 p.ct. pref. 70½, Imperial Continental 198, 199, 200, 200½, Primitiva 26s. 4½d., 26s. 6d., South Metropolitan 107½, 107¾, 3 p.ct. deb. 60, South Suburban 5 p.ct. deb. 97½, Tottenham "B" 102, 102¼, 4 p.ct. deb. 76½. Supplementary prices, Brighton and Hove 6 p.ct. pref. 106, Gas Light and Coke 5 p.ct. deb. 1952-57 100¾, Harrogate new consolidated £166 13s. 4d., 167½, Hornsey new 5 p.ct. pref. 87, Southgate and District 7 p.ct. max. 109, 109½.

On Thursday, Alliance and Dublin 98⅞, Bournemouth "B" 12⅜, British 116½, Commercial 100, Continental Union 106, 106¼, 107, 107½, 108, 108¼, 109, 110, European 9⅞, 9 1/16, 10, Gas Light and Coke 18s. 3d., 18s. 4½d., 18s. 5¼d., 18s. 6d., Imperial Continental 200, 200½, 201, 201¼, 201⅜, 201½, 202, 202½, 202¾, 203, 203½, 204, Primitiva 26s. 3d., 26s. 4½d., 26s. 6d., 26s. 7½d., 26s. 8¼d., 26s. 9d., South Metropolitan 107, 107¾, South Suburban 5 p.ct. deb. 100, Southampton 4 p.ct. deb. 73, Tottenham "B" 103¼. Supplementary prices, Gas Light and Coke 5 p.ct. deb. 1952-57 100¾, Rugby 6 p.ct. pref. 95, 95½, Southgate and District 7 p.ct. max. 109, 109½.

On Friday, Alliance and Dublin 99, Bournemouth "B" 12⅝, Continental Union 110⅜, 110½, 111, 112½, European 9 1/16, 10, 10 3/16, 10¼, 10 5/16, Gas Light and Coke 18s. 1½d., 18s. 3d., 18s. 4½d., 18s. 6d., 4 p.ct. pref. 79½, Imperial Continental 201, 208, 209, 210, 211, 212, 217, 219, Metropolitan (of Melbourne) 5½ p.ct. deb. 101¼, 101½, Primitiva 26s. 3d., 26s. 4½d., 26s. 7½d., 26s. 9d., 4 p.ct. 1st deb. 92½, South Metropolitan 107, 107¾, 3 p.ct. deb. 61⅜, Southampton 4 p.ct. deb. 74. Supplementary prices, Bournemouth 7 p.ct. deb. 104½, Brighton and Hove 6 p.ct. "B" pref. 110, Dover 7½ p.ct. 119, 119½, Gas Light and Coke 5 p.ct. deb. 1952-57 100¾, Liverpool 5 p.ct. 90½.

In the Money Market the usual week-end ease was experienced. Old loans were renewed at 3 p.ct., and fresh accommodation was available at and below 2½ p.ct. With the prospect of dearer money this week, the average rate at which Treasury Bills were allotted was 10·92d. p.ct. higher at £4 6s. 6d. p.ct. Discounts were firm, and fine bank bills were placed at 4 7/16 p.ct.

In the Foreign Exchange Market, the New York rate was firmer at 4.85 7/32; the German exchange moved against sterling, and closed at 20.38¼; Italian lire finished at 92.64½; Dutch florins at 12.07⅜; and pesetas at 29.73. French francs and Belgas were unchanged at 124.6¼ and 34.89 respectively.

Silver was quiet, and the price unchanged at 26 5/16d. per oz.; while with no Gold available, the nominal price was 84s. 11¼d. per oz.

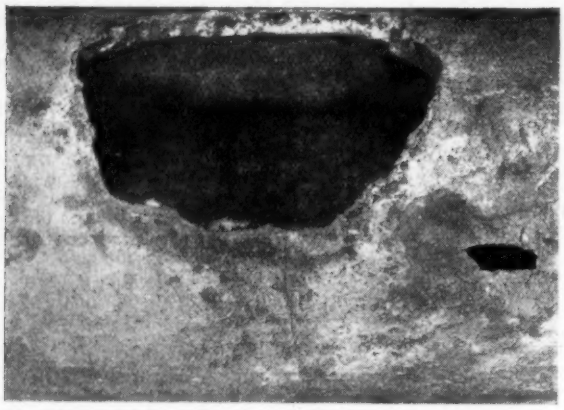
The Bank Rate is 4½ p.ct., to which it was reduced from 5 p.ct. on April 21, 1927. The Banks' deposit rate is 2½ p.ct., and the deposit rates of the discount houses are 2½ p.ct. at call and 2¾ p.ct. at notice.

ELECTROLYSIS OF A GLASGOW GAS MAIN.

Electricity the Cause of a Fatality.

The accompanying photograph is of a 6-in. main recently removed from the distributing system of the Glasgow Corporation Gas Department.

It will be observed that a hole (roughly 5 in. by 4 in.) has been melted out of the main. The damage was done by a fused electric cable, which crossed it at right-angles and was in close proximity to it, and which had been laid subsequent to the gas main. Remains of the cable were, in fact, found at the bottom of the main.



Unfortunately the resulting escape of gas caused the death of a lady in property adjoining; death having occurred before the leakage was notified to the Gas Department.

Employees of the Electricity Department had been engaged during the previous week in an attempt to locate a fault on their mains; and they reported that the fault had "righted itself." It is unfortunate that gas always obtains the unwanted advertisement in such cases; the real offender getting off with very little publicity.

FORTHCOMING ENGAGEMENTS.

[*Secretaries of Gas and Kindred Organizations are asked to assist in making this diary of events as complete and useful as possible by sending the earliest intimation of all meetings.*]

Jan. 12.—SCOTTISH JUNIOR GAS ASSOCIATION (EASTERN DISTRICT).—Joint Meeting with Western District at Glasgow. Paper by Mr. C. Chapman, Provan Chemical Works, Glasgow, on "Tar."

Jan. 16.—SOUTHERN ASSOCIATION OF GAS ENGINEERS AND MANAGERS (EASTERN DISTRICT).—Meeting.

Jan. 16.—ROYAL SOCIETY OF ARTS.—Meeting in John Street, Adelphi, W.C. 2, at 8 p.m. Paper on "The Domestic Smoke Problem: A Practical Solution," by Prof. C. R. Darling.

Jan. 17.—SOCIETY OF BRITISH GAS INDUSTRIES.—Council meeting in the afternoon.

Jan. 18.—INSTITUTION OF CHEMICAL ENGINEERS.—Meeting at the Institution of Civil Engineers, 6.30. Lecture by Prof. J. W. Cobb on "The Reactivities of Solid Carbon in Fuel Processes."

Jan. 19.—YORKSHIRE JUNIOR GAS ASSOCIATION.—Meeting in Halifax. Paper by Mr. J. W. Denton, on "High-Pressure Governors and Plant." Inspection of the Halifax Gas-Works.

Jan. 21.—MIDLAND ASSOCIATION OF GAS ENGINEERS AND MANAGERS.—Dinner and dance at the Grand Hotel, Birmingham.

Jan. 21.—ROYAL SOCIETY OF ARTS.—Meeting in John Street, Adelphi, W.C. 2, at 8 p.m. First Cantor Lecture by Dr. C. H. Lander on "The Treatment of Coal."

Jan. 25.—LONDON AND SOUTHERN DISTRICT JUNIOR GAS ASSOCIATION.—Meeting at the Westminster Technical Institute. Paper by Mr. C. A. Masterman, on "The Thermal Insulation of Gas Consuming Apparatus."

Jan. 26.—SCOTTISH JUNIOR GAS ASSOCIATION (WESTERN DISTRICT).—Visit to Messrs. Peebles & Co., Ltd., Tay Works, Bonnington, Edinburgh.

Jan. 28.—ROYAL SOCIETY OF ARTS.—Meeting in John Street, Adelphi, W.C. 2, at 8 p.m. Second Cantor Lecture by Dr. C. H. Lander on "The Treatment of Coal."

Feb. 4.—ROYAL SOCIETY OF ARTS.—Meeting in John Street, Adelphi, W.C. 2, at 8 p.m. Third Cantor Lecture by Dr. C. H. Lander on "The Treatment of Coal."

Feb. 12.—NATIONAL GAS COUNCIL.—Meeting of the Central Executive Board.

Feb. 12.—FEDERATION OF GAS EMPLOYERS.—Meeting of Central Committee.

EXTENSIONS AT PENRITH GAS-WORKS.

Opening Ceremony.

The official opening of the extensions and renewals to the Penrith Gas-Works, which have recently been carried out at a cost of nearly £11,000, as part of a larger scheme (including the erection of extra beds of retorts, and new condensers) which, it is hoped, will be completed within the next few months, was performed on Dec. 17.

Several members and ex-members of the Council, together with some of the staff, assembled at the works to inspect the renewals and additions. The Engineer and Manager, Mr. J. Corrigan, conducted the party round the works, and explained what had been done.

Two new sets of exhausters and steam engines have been installed by Messrs. G. Waller & Sons, Ltd., of Stroud, each capable of passing 25,000 c.ft. of gas per hour. It is now possible to deal with the increased makes of gas by running each set alternately. A complete new washing plant has been installed, consisting of a cast-iron washer, 6 ft. by 5 ft. by 3½ ft. deep, and a steam driven horizontal rotary washer scrubber. The whole unit will pass three-quarters of a million c.ft. of gas per day. The contractors were Messrs. W. C. Holmes & Co., Ltd., of Huddersfield. A cast-iron purifier, 20 ft. by 20 ft. by 5 ft. deep, has been erected by Messrs. Drakes, Ltd., of Halifax. It is worked by three 12 ft. rack and pinion valves, and is coupled up to the main purifiers. The hot coke is now removed from the retort house by means of an electrically propelled coke bus, which runs on rails inside the house, and on an elevated track in the coke yard. The coke bus and track have been erected by Messrs. Drakes, Ltd. An old gasholder, erected in 1863, has been dismantled, and the existing masonry tank utilized to receive a new 3-lift spiral guided gasholder erected by Messrs. Newton, Chambers, & Co., of Thorncliffe. The new holder has an average diameter of 57 ft. 9 in., and each lift is 18 ft. 9 in. deep. The total height when fully inflated is 55 ft., and it will store 140,000 c.ft. of gas.

When the party reached the buildings where the supply is sent into the mains, Mr. R. HUNTER (Chairman of the Council) opened a valve, and sent the supply from the gasholder into the town.

Mr. J. E. NEWTON, Chairman of the Council's Gas and Water Committee, thanked Mr. Hunter for having turned on the new supply, and spoke of his excellent work as Chairman of the Council.

After inspecting the works, the company adjourned to the showrooms.

Mr. NEWTON, speaking of the gas undertaking, observed that, in 1879, when the works were taken over by the Local Board, the make was 13,647,000 c.ft., and the price 4s. 5d. per 1000 c.ft. When the Urban Council succeeded that body in 1895, the make was 32,922,000 c.ft., and the price 2s. 6d. By 1914 the make had reached 60 million c.ft., and the price was 2s. 3d. That was in a time of pre-war values. Now the make was 75 million c.ft., and the price 3s. 6d.; and at the Council meeting on Dec. 19 they would consider a recommendation to reduce the price by a further 3d. That would make it 3s. 3d. to the ordinary consumer, and about 3s. for those who took the discount for prompt payment. The total capital expenditure up to March 31, 1928, had been £47,000; and of this, £40,000 had been repaid, leaving a debt of only £6820. In addition to the redemption of loan, the sum of £11,633 had been transferred to the Council for relief of the district rates. Mr. Newton then detailed the events leading up to the present additions and renewals, for which the Council received sanction to borrow £10,850, and said it was hoped to complete the scheme next year. He paid a tribute to the work of the contractors, and also to the excellent work and engineering skill of Mr. Corrigan, who had supervised the carrying-out of the work.

Mr. HUNTER moved a vote of thanks to Mr. Newton, and spoke of his great abilities as Chairman of the Committee, and also to the fact that he had been backed up by a strong Committee.

Mr. NEWTON, in reply, said that he was looking forward to the early part of next year, when it was hoped the Manager would be able to inaugurate a scheme for the free maintenance of consumers' fittings.

Mr. JOHNSTON, in congratulating the Committee on their progress, referred to the excellent staff, particularly mentioning Mr. Wainwright, Mr. Corrigan, Mr. Longstaff, and Mr. Scott.

Mr. F. STEPHENSON, in proposing the toast of the Manager, spoke of the great confidence which the Committee reposed in Mr. Corrigan.

BOARD OF TRADE GAS UNDERTAKINGS RETURN FOR 1927.

PART II.—FINANCE AND PRICES.

The second part of the Return for the year 1927 relating to all Authorized Gas Undertakings in Great Britain has been issued by H.M. Stationery Office (Adastral House, Kingsway, London, W.C. 2, and Branches), at the price of 10s. 6d. net, postage extra. This furnishes the usual statistics bearing upon finance and prices; while Part I. (which was reviewed in the "JOURNAL" for July 25 and Aug. 1, pp. 200 and 266 respectively) dealt with manufacture and supply.

There are dealt with in this part of the Return 782 undertakings, which is the same number as a year ago, and also the same number as was included in Part I. On this occasion, the companies, at 462, number one less than they did a year ago; but the local authorities, at 320, are one more than was the case in the 1926 Return. The particulars as to prices charged are, unless otherwise indicated, for Dec. 31, 1927, for English and Welsh undertakings, and May 15, 1927, for Scottish ones. The other information given in the Return relates (except where otherwise noted) to the calendar year 1927 in the case of companies' undertakings, and, for local authorities, to the year ended March 31, 1928, for concerns in England and Wales, and the year ended May 15, 1927, for those in Scotland.

The differences in these periods, especially in the case of Scottish local authority undertakings, must be borne in mind when considering the comparative tables, having regard to the period covered by the coal stoppage of 1926—*e.g.*, the net profit of £1,570,918 obtained by local authorities in England and Wales during the year ended March 31, 1928, when combined in the comparative table with the deficit of £1,125,524 incurred by the Scottish local authorities during the year ended May 15, 1927, shows a net profit for all local authority undertakings of only £445,394.

CAPITAL INVESTED.

The total nominal capital invested in the undertakings dealt with in the Return is £183,405,321 (including loans borrowed by local authorities and since repaid), an increase of £4,381,420 over the amount shown in the previous Return. The receipts of the undertakings on revenue account (£74,830,307) show an increase of £128,439 over the previous year's total, but the expenditure (£63,612,848) shows a decrease of £3,359,899; the gross profit being increased by £3,488,338.

Comparative tables in the Return, which are reproduced below, set out separately the financial results for the companies' undertakings and those belonging to local authorities for the whole of Great Britain—in the former case for the years 1920 to 1927, and in the latter for the financial years 1920-21 to 1927-28.

COMPANIES.

In connection with the companies, the figures in the body of the Return for 1927 are further split-up as follows:

England and Wales.—Total capital authorized, £102,154,715; capital and premiums paid-up, £88,322,699; loan capital authorized, £42,354,767; loan capital issued, £26,061,237; revenue account receipts, £49,727,959; expenditure, £42,443,012; profit, £7,285,868 (loss, £921).

Scotland.—Total capital authorized, £310,656; capital paid-up, £259,058; loan capital authorized, £123,491; loan capital issued, £74,025; revenue account receipts, £157,892; expenditure, £131,948; profit, £25,944.

LOCAL AUTHORITIES.

The corresponding figures in the Return for the local authorities for 1927-28 are divided-up thus:

England and Wales.—Total amount of loans authorized, £57,549,155; money borrowed, £53,621,207; loans repaid and balance left in sinking fund, £29,984,047; revenue receipts, £19,259,377; expenditure, £15,004,748; gross profit, £4,256,094 (loss, £1465); interest paid on loans, loans repaid, and amounts placed to sinking fund during the year, £2,683,052; net profit, £1,571,577.

Scotland.—Total amount of loans authorized, £16,882,645; money borrowed, £15,067,095; loans repaid and balance in sinking fund, £7,346,435; revenue account receipts, £5,685,079; expenditure, £6,033,140; gross profit, £356,159; loss, £704,220; interest paid on loans, amount of loans repaid, and amounts placed to sinking fund during the year, £777,463; loss, £1,125,524.

In addition to the columns shown in the tables reproduced, the Return gives information as to the Special Acts of Parliament and Orders relating to each undertaking, as well as the maximum or standard price of gas per therm, or per 1000 c.ft., as the case may be, and the actual prices charged to prepayment consumers, to ordinary consumers, for power, &c., and for public lamps. There is also a column showing the scale of annual charges for meter rent to private consumers.

COMPARATIVE TABLES.

Companies' Undertakings.

Year.	Number of Authorized Undertakings included in Return.	Total Capital (Share and Stock).		Total Loan Capital, including Debenture Stock.		Revenue Account.		
		Authorized.	Paid-up.	Authorized.	Issued.	Receipts.	Expenditure.	Profit.
		£	£	£	£	£	£	£
1920 . . .	494	98,469,716	82,065,243	29,109,279	18,418,665	53,714,841	49,566,608	4,148,233
1921 . . .	488	99,422,967	83,063,256	32,357,024	21,104,283	51,870,058	47,588,176	4,281,882
1922 . . .	481	100,437,430	83,793,973	33,751,958	22,011,223	46,541,952	39,785,069	6,756,883
1923 . . .	475	100,374,599	84,561,849	33,957,362	22,035,911	44,226,797	37,839,199	6,387,598
1924 . . .	467	100,553,738	85,537,819	34,581,299	22,544,907	44,293,709	38,756,098	5,537,611
1925 . . .	465	100,871,912	86,557,396	33,146,038	22,778,217	43,931,719	38,098,485	5,833,234
1926 . . .	463	101,398,265	87,657,953	41,115,715	25,370,284	48,972,181	43,811,615	5,160,566
1927 . . .	462	102,465,371	88,581,757	42,478,258	26,135,262	49,885,851	42,574,960	7,310,891

Local Authorities' Undertakings.

Year.	Number of Authorized Undertakings included in Return.	Total Amount of Loans Authorized.	Total Amount of Money Borrowed.	Total Amount of Loans Repaid, and Balance in Sinking Fund.	Revenue Account.			Interest paid on Loans, Amount of Loans Repaid, and Amount placed to Sinking Fund during Year.	Net Profit or *Deficit*.
					Receipts.	Expenditure.	Gross Profit.		
		£	£	£	£	£	£	£	£
1920-21 .	304	52,823,504	48,916,008	25,076,806	27,244,570	24,535,685	2,708,885	2,269,573	439,312 profit
1921-22 .	309	60,767,887	53,770,157	26,725,430	26,569,144	25,061,731	1,507,413	2,610,228	*1,102,815 deficit*
1922-23 .	316	64,519,579	57,123,829	28,616,471	24,084,699	19,414,366	4,670,333	2,901,500	1,768,833 profit
1923-24 .	310	65,533,169	58,612,494	30,027,099	23,349,561	18,754,701	4,594,860	2,965,295	1,629,565 profit
1924-25 .	315	67,625,057	60,323,048	31,746,240	22,416,281	19,131,529	3,284,752	3,026,677	258,075 profit
1925-26 .	317	69,392,637	62,652,376	33,426,330	22,110,924	18,810,163	3,300,761	3,053,909	246,852 profit
1926-27 .	319	72,432,893	65,996,664	35,070,757	25,729,687	23,161,132	2,568,555	3,210,529	*641,974 deficit*
1927-28 .	320	74,431,800	68,688,302	37,330,482	24,944,456	21,037,888	3,906,568	3,460,515	446,053 profit

ANOTHER STEP TOWARDS GENERAL HIGH-PRESSURE DISTRIBUTION IN GERMANY.

[COMMUNICATED.]

The grand scheme of the Ruhr to establish, by means of high-pressure gas distribution, the monopoly in Germany in both solid and gaseous fuel found, it will be remembered, its principal opponents in the camp of the private gas companies, and more especially in the Dessau concern. It was with the object of securing its future independence that a year ago the far-seeing management of this up-to-date undertaking purchased from the Bergwerksgesellschaft G.v.Giesche's Erben, the most eastern of the Ruhr collieries, the Zeche Westfalen, which is rich in good coking coals. The coal basis for future plans being thus secured, a few days before Christmas Herr Heck succeeded in taking another step—this time in the direction of his own sphere of action, the gas industry proper—by bringing into combination the Westfalen Colliery and the Dessau Gas Company on the one side, and the Town of Magdeburg, the Province of Saxony, and the Anhalt Free State on the other.

The new scheme will comprise two different companies—an A-Company for the manufacture, and a B-Company for the distribution, of gas. The A-Company, formed and controlled by the Colliery and the Town of Magdeburg, are to erect a coke oven plant on the spot, where the new Mittelland Canal will in 1930 reach the River Elbe. At this eminently suitable site coal can arrive with equal facility from the Westfalen Colliery or from England, via Hamburg, in 1000-ton barges.

In order to understand the fundamental idea of the A-Company, one has to keep in mind that all the German collieries, including the Zeche Westfalen, are combined by a compulsory Syndicate, and that this Syndicate have the right of levying a contribution per ton of coal in order to meet their expenses. All the coal, however, used by the collieries for their own purposes, or in works in their possession, is either entirely free from the contribution or pays only a certain percentage (51 p.ct. at present). In order to secure this important advantage, it was necessary to make the colliery a shareholder of the A Company to the extent of 51 p.ct.—a percentage which might be altered and adapted to future circumstances and requirements. The remaining 49 p.ct. was reserved for the Town of Magdeburg.

SECURING THE GOODWILL OF PUBLIC AUTHORITIES.

The modern coke oven plant to be erected by this Company is expected to become a paying proposition, because excellent coal at a minimum price is secured, and because there is in that part of Germany a large market, at favourable prices, for metallurgical coke; the competing Ruhr coke having the disadvantage of a long transport. The A-Company should therefore be able to work at a profit, and at the same time supply their gas at a moderate price to the B-Company, which is meant to be the instrument of distribution. In order to make this possible, it was necessary to come to terms with the owner of the public highways—viz., the State and provincial authorities. Eventually the goodwill of these was secured by the distribution among them of a certain number of shares, making the final proportion as follows:

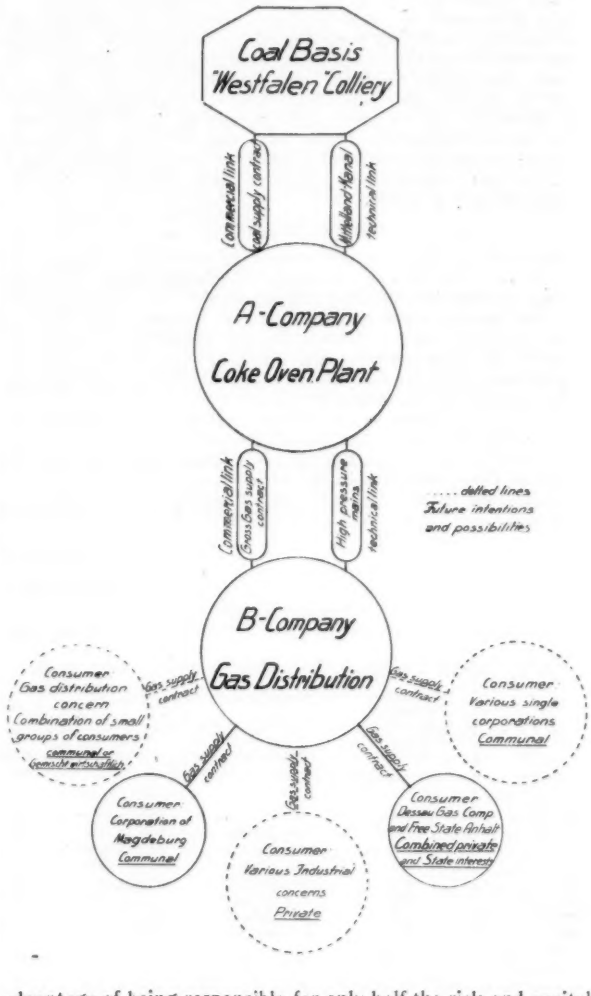
Town of Magdeburg	51 p.ct.
Dessau Gas Company	37 ,,
Province of Saxony	9 ,,
Free State Anhalt	3 ,,
	100 p.ct.

The Town of Magdeburg and the Dessau Company for the towns of Dessau, Köthen, Zerbst, Rosslau, Aken, Oranienbaum, Kalbe, and Nienburg are free to purchase gas from the B-Company, but also to make use of their existing gas-works up to their present capacity. Any surplus requirements, however, must be taken from the new central gas-works. On the other hand, the B-Company is free to distribute gas, either directly or by the formation of subsidiary companies, to towns or districts that may be inclined to come to terms with them in future.

THE GAS INDUSTRY AND THE LABOUR PARTY.

The proceedings and organizations described above are a good illustration of the adaptability of private enterprise to novel conditions. A century ago the Britisher came to the Continent as the skilled gas-engineer, and obtained from the municipalities concessions for the erection of gas-works, an example which was later on imitated by the native companies. In the socialistic Germany of to-day no municipality will dream of granting a similar concession, for the reigning Labour Party are fully convinced that a municipal gas-works under their control is superior to a company. The old-established concessions, on the other hand, have lost most of their value, because every renewal had to be bought by heavy sacrifices. So the days of prosperity seemed to be numbered for the private gas companies in Germany. Now all at once the leading gas company has re-appeared on the scene, not in the part of the skilled gas engineer as formerly, but in the more attractive role of the colliery owner. Moreover, it is skilfully meeting half-way the ever-increasing appetite of the Labour Party for municipal enterprise, and offers organizations in which all the honours as majorities and chairs in the Boards of Directors are reserved for municipal leaders; one modest, but important, exception, however, being made in favour of the Company—viz., the condition that the chair and the majority in the Working Committees are to be controlled by them. In consequence the business proper will not be conducted by politicians, but by capable and experienced men of business.

The drawback of the new system from the Company's point of view—viz., the necessity of sharing profit and management with the Corporation—is more than counter-balanced by the



advantage of being responsible for only half the risk and capital outlay. Moreover, under the old concession contracts, invariably a large percentage of the gross gas rental went to the municipalities as a rent or a contribution towards the rates. This having been avoided, the new Company will be in a better position to sell their gas at a reasonable price. Such a remarkable development, which would have been out of the question a few years ago, has its origin in the struggle of the Ruhr towards the monopoly of gas supply, and must be regarded as the counter-action thereto, and as an important step towards the final execution of the programme favoured by the German gas industry—viz., the creation of various centres of high-pressure gas supply and distribution throughout the country, a system which is known under the name "Die regionale Gas-Fernversorgung."

The new combination has also a great practical significance. Even if with heavy sacrifices the Ruhr people have secured a contract with the town of Hanover, it was with the hope that they might eventually, via Magdeburg, push on to Berlin.

Now they find in their path the formidable obstacle of the Magdeburg-Dessau concern.

COKE OVENS TO THE FRONT.

From a general point of view, the high-pressure gas movement is highly instructive. In the same way as that fruitful scientific theory the famous benzole ring invented by Kékulé has become the nucleus of the gigantic modern dye-stuff industry, the slogan of high-pressure distribution has given a new and very strong impetus to the German gas business. This influence is not confined to questions of organization and combination. The very foundations of the gas trade are in a state of revolution, starting with the gas producing plants. For the last twenty years the vertical retort has dominated the gas industry, and has brought about the idea of a high production of gas per ton of coal, and a large reduction in the figures of coal carbonized and coke left for sale. This has resulted in comparatively moderate coal costs and high coke prices. Though this system has been entirely successful, and though its leading ideas are as sound as ever, the Ruhr movement has all at once brought the coke oven to the front. Not only in Magdeburg, but also in Düsseldorf and Cologne, at Frankfort, Stuttgart, Basle, and Zurich, coke oven plants have been erected or are being proposed; the main idea being that, by the carbonization of large quantities of cheap coal and the production of equally large quantities of highly priced coke, the comparatively small output of gas gained as a bye-product will cost next to nothing.

With the same idea, numerous modern coke ovens have been erected in the Ruhr. It is clear that the result of this speculation is entirely dependent on the coke market, and the latter to a very large extent on the iron industry, which, however, is notoriously in a precarious condition, owing to the continuous increase in the rate of wages brought about by the compulsory arbitration of the German Law. The time is supposed to be in view when the competition of the French and the Belgians, working under much more favourable conditions, will cripple the German iron industry, with the result that the prevailing calculations would be simply reduced to absurdity. Besides the vertical retort and the coke oven, there is another competitor in the field, making great efforts and still more noise—the gas from lignite collieries in Central Germany and at Frankfort.

Apart from the producing plants, the gas engineer's mind is naturally occupied and fascinated by the technical and commercial aspects of high-pressure distribution.

GAS TARIFFS.

Another important branch of the gas business, which is threatened to be revolutionized, and is the centre of discussion and attention, is the method of charging for gas. The Ruhr and its competitors have recognized the fact that a very big gas consumption is only possible when the prices charged to the ultimate consumer are extremely low. But it is very much a question, and certainly a puzzle to the commercially trained engineer, whether under such conditions gas will be a paying proposition. Nevertheless, the more or less fierce discussion, and the publicity which has been accorded to it, are bound to have a wholesome influence on the somewhat stagnant pool of German gas tariffs. With regard to organization, as a matter of course everybody concerned is active in trying to secure a good slice of the country as a future field for gas distribution, before it becomes too late; and there can be very little doubt that in a comparatively short time the whole country will be divided up among a small number of gas concerns. The future consumption of gas will be beneficially influenced by this movement. In fact, the present situation of the gas industry is compared by optimists with the period some twenty years ago, when the electricians vigorously attacked the problem of rural supply, and founded the so-called "Ueberland-Zentralen," which were at that time regarded by many experts as a commercial failure, but which, without exception, pay large dividends nowadays. The author, however, cannot share this optimism, for the landowners, suffering from the serious crisis in agriculture, and provided already with electric light and power, will be, he is afraid, poor customers of gas for cooking and heating.

Whether or not high-pressure distribution becomes a commercial success, the German gas supply as such will certainly profit by being for a number of years the object of great technical and commercial activity, and the centre of public attention.

GAS BILLS FOR 1929.

ILKLEY.

In a General Purposes Bill which is being promoted by the Ilkley Urban District Council there are a number of clauses relating to the gas undertaking, these being mainly on model lines. Any person having control of premises which the Council are authorized to enter who does not permit such entry shall be liable to a penalty not exceeding £5. Power is taken to compel repairs in case of danger, and to provide showrooms. The provisions of section 59 of the Rating and Valuation Act, 1925, relating to the sending or service of demand notes shall apply to demand notes for any charges made in connection with the gas undertaking.

[*Parliamentary Agents: Messrs. Lees & Co.*]

LONDON AND HOME COUNTIES ELECTRICITY.

A Bill of the London and Home Counties Joint Electricity Authority has for its object the transfer to them of the powers of local authorities to acquire electricity undertakings in their district, to extend the district, and other matters. Among the large number of Acts and Orders which are affected by this transfer of powers to acquire are the Ascot District Gas and Electricity Acts, the Wood Green Electric Lighting Order, and the Tottenham and Edmonton Gas Act of 1913. The Bill also contains provisions for dividing the district into distribution areas, and for the establishment of Joint Committees of the Authority and the local authorities within such areas.

[*Parliamentary Agents: Messrs. Sharpe, Pritchard, & Co.*]

NEWCASTLE-UPON-TYNE.

Under the provisions of the Newcastle-upon-Tyne and Gateshead Gas Company's Acts and Orders, 1864 to 1928, the dividends payable on the ordinary capital may exceed the standard rate of 3½ p.ct. per annum in respect of periods in which the price charged by the Company for gas in the City and County of Newcastle-upon-Tyne and the County Borough of Gateshead is below a standard price of 11d. per therm. The Company are empowered to charge within this district a price not exceeding 12·4d. per therm, and in other parts of their area differential rates are allowed.

BASIC PRICES AND DIVIDEND.

The Bill specifies a calorific value for the gas of 500 B.Th.U.; and the basic prices are to be as follows: Within the City and County of Newcastle-upon-Tyne, the County Borough of Gateshead, and the Borough of Wallsend, 8d. per therm. Within the townships of Chester-le-Street and Pelton, 10·2d. per therm. Within the County Borough of Tynemouth and the urban district of Whitley and Monkseaton, until Dec. 31, 1930, 9·1d. per therm; from Jan. 1, 1931, to Dec. 31, 1933, 8·9d. per therm; on and from Jan. 1, 1934, 8·7d. per therm. Within the urban district of Earsdon, until Dec. 31, 1930, 10·2d. per therm; from Jan. 1, 1931, to Dec. 31, 1933, 10d. per therm; on and from Jan. 1, 1934, 9·8d. per therm. Within the urban district of Seaton Delaval, until Dec. 31, 1930, 11·2d. per therm; from Jan. 1, 1931, to Dec. 31, 1933, 11d. per therm; on and from Jan. 1, 1934, 10·8d. per therm. Within the remainder of the limits of supply—the outer area—9·5d. per therm. The Company may charge for gas supplied by them in the outer area a price per therm exceeding by not more than 3·6d. the price for the time being charged in the Newcastle area.

The Company may charge for gas supplied by them a price greater or less than the basic price; but, except as otherwise provided, the Company shall not declare any larger dividend on the ordinary stock than 5 p.ct. per annum. The following provisions are to have effect with respect to the division of the profits of the Company:

> At the end of each year, a sum shall be calculated representing the amount (if any) by which the total amount (after deducting discount) payable by consumers or purchasers of gas supplied during such year has been less than the amount which would have been payable if the charge for the gas so supplied had been calculated at the basic price; and for the purposes of this paragraph the amount payable by a consumer of gas supplied through a prepayment meter shall be deemed to be the amount which would have been payable if the gas so supplied had been supplied through an ordinary meter.
>
> If and so far as the balance standing to the credit of the net revenue account (after providing for dividend on the preference stock of the Company, and dividend at the basic rate on the ordinary stock of the Company) in the opinion of the Directors permits, a sum not exceeding one-third of the sum calculated pursuant to the foregoing paragraph shall be applied in two equal parts for the benefit of the holders of ordinary stock and for the benefit of the co-partners in manner hereinafter provided.
>
> Any sum to be so applied for the benefit of the holders of ordinary stock may be applied in the payment of dividend at a rate additional to the basic rate, and if and so far as not so applied shall be carried to the reserve fund.
>
> Any sum to be so applied for the benefit of the co-partners of the Company shall be applied by way of bonus addition to the salaries and wages of such co-partners, or carried to the credit of any one or more of the following funds: The Pensions Fund, the Widows' and Orphans' Fund, the fund of the Employees'

Sick Benefit Society, and any fund to be formed in connection with any profit-sharing scheme which may be established under this Act, as and in such proportions as the Directors may determine.

Any balance of the profits of the Company not applied as aforesaid shall be carried forward to the credit of the net revenue account for the next following year. Provided that the sum so carried forward shall not exceed the total of the following amounts:

(*a*) The amount required by the Company for paying any dividend on preference capital or ordinary capital or interest on moneys borrowed for the purposes of the undertaking which the Company are entitled or required to pay, but have not paid in respect of the year preceding such following year.

(*b*) An amount equal to the total sum which will be required for paying one year's dividend on the preference capital of the Company and one year's dividend at the basic rate on the ordinary capital of the Company.

(*c*) An amount equal to the total sum which the Company will be required to pay during the next following year as interest on any mortgages or debenture stock.

(*d*) Any amount required to be applied for the benefit of the co-partners in respect of the year preceding such following year, but which the Company have not so applied.

Discounts.

If payment be made within twenty-one days of the receipt of account, or on or before the tenth day of the month following that in which the account is delivered (whichever shall last happen), the Company shall allow a discount of 10 p.ct. if the consumption shall not have exceeded 2000 therms per quarter; and if the consumption shall have exceeded this figure, 15 p.ct. discount is to be allowed. The Company shall on every such account conspicuously denote the last day for the allowance of any discount.

Revision of Basic Prices.

The Company shall not later than in the session of 1939 promote a Bill in Parliament proposing a revision of the basic prices fixed by this Act, or giving an opportunity for such revision. The council of any county or of any borough or urban district within or partly within the limits of supply shall (subject to their complying with any relevant statutory requirements and Standing Orders of Parliament) be entitled to be heard on such Bill.

Price of Supply to Public Lamps.

The price charged for supplies to consumers using gas for any trade or industrial purposes, in bulk to any local authority, &c., or to any consumer in whose case the price for gas supplied does not comprise the whole of the charge in respect of the supply, shall not be taken into account in ascertaining the price for supplies to public lamps.

Bulk Supplies and Purchase of Residuals.

Power is taken to establish profit-sharing and to contract with any local authority, company, or person for the supply by or to the Company to or by such local authority, company, or person of gas in bulk upon such terms and conditions as may be agreed upon. Provided that the Company shall not supply gas under the powers of this section in any area in which any local authority, company, or person is authorized to supply gas, except with the consent of such local authority, company, or person. It shall be lawful for the Company, for the purpose of taking or affording a supply of gas in bulk, to lay mains outside the limits of supply, and for that purpose to exercise outside those limits the like powers of opening and breaking-up streets and bridges as are exercisable by them within the limits of supply, and subject to the like conditions, restrictions, and obligations.

The Company may, notwithstanding anything to the contrary contained in any Act or Order relating to them, purchase in such quantities as they think fit from any company, body, or person any residual products arising directly or indirectly from the carbonization or gasification of coal, and may exercise in relation to residual products so purchased the powers which would have been exercisable by them if such residual products had arisen directly or indirectly from the manufacture of gas by the Company. The powers conferred by this section are to be in addition to, and not in derogation of, any powers conferred, or to be conferred, upon the Company by any Act or Order.

The clause relating to the testing of dried gas which was quoted when referring to the Gas Light and Coke Company's Bill on p. 41 of last week's issue of the "Journal" is included also in the Newcastle Bill.

Agreements Between the Company and Other Gas Companies.

The Company and any company, body, or person carrying on a gas undertaking may, with the approval of the Board of Trade, enter into, and carry into effect, agreements for the amalgamation, purchase, leasing, or joint working, or management, of their respective undertakings, including agreements for the provision and joint use of buildings, works, or plant, and for the setting-up and carrying on of establishments for research, and generally for any purpose which will, in the opinion of the parties to any such agreement, conduce to the more economical or efficient manufacture, distribution, and sale of gas, or manufacture, working-up, conversion, sale, or use of residual products. The Company shall, if the Board of Trade so direct, give notice in such manner as the Board may require of any application for the approval of the Board to any agreement entered into, or proposed to be entered into, including (if so required) notice to the council of every county, county or other municipal borough, and urban district wholly or partly within any area in which the parties to such agreement supply, or are authorized to supply, gas, or which is otherwise affected by such agreement; and the Board shall, before giving such approval, consider any representations which may be made to them.

Powers with Reference to Companies Formed for Laying of Pipes.

Notwithstanding anything contained in any Act or Order relating to the Company, it shall be lawful for the Company to subscribe for, purchase, or acquire and hold, or dispose of, any shares, stock, mortgages, debentures, or debenture stock of, or to lend money to, any company formed for the purpose of providing or laying pipes for the transmission of gas, or to guarantee the payment of preferential or other dividends or interest on any shares, &c., issued by any such company; and to use for the purposes of their undertaking any pipes provided or laid by any such company, and pay rent or other consideration for such use.

Power is taken to invest in securities of other companies, &c., who are engaged in the manufacture, distribution, or sale of gas or residual products, or who carry on any business in connection with residual products, or in connection with the production, sale, carbonization, gasification, and distribution of coal, coke, or oil, or of products arising therefrom, or any of those matters, or having objects similar or ancillary to the purposes of the Newcastle Company. Any agreement entered into under the foregoing provisions may provide for securities being taken as consideration. Loans may be granted to other companies, or securities exchanged, to such extent as, in the opinion of the Directors of such other company, will be of advantage for furthering the purposes of such agreement—including the reduction of the price of gas. Power is asked to offer stock for subscription, and to issue it to stockholders, consumers, and employees.

Appointment of Officers as Directors.

The Directors may at any time appoint any chief engineer, general manager, or secretary to be a Director of the Company, provided that in no event shall there be at the same time more than one such person holding office as a Director, and that any person so appointed shall, unless the appointment is approved by a majority of the shareholders at the next annual general meeting, cease to be a Director as from the date of that meeting. Any person appointed as a Director under the provisions of this section shall not be subject to retirement by rotation, and shall not be taken into account in determining the rotation of retirement of Directors.

[*Parliamentary Agents: Messrs. Dyson, Bell, & Co.*]

NEWPORT (SALOP).

Provision for the Management of the Gas Undertaking.

A Bill is being promoted by the Newport (Salop) Urban District Council to vest in them the property and liabilities of the Newport Town and Marsh Trustees. Portions of the lands involved have been leased to the Newport Gas Light and Coke Company, Ltd., for a term of years expiring on July 28, 1934, for the purposes of the construction of gas-works, subject in each case to the right of the Trustees, on the expiration of the leases, to resume possession of the lands, "gas pipes, and other fixtures, articles, and things connected with the gasholders erected thereon and the manufacture, conveyance, and consumption of the gas under, through, and upon the streets." The Company, by means of the works constructed upon these lands, are now affording supplies of gas in the district and in certain adjoining areas; and it is desired to make provision for the management of the gas undertaking by the Council after it shall have become vested in them at or before the expiration of the leases. The property and liabilities of the Trustees are to be transferred on April 1, 1930.

The provisions relating to gas are to come into operation as from the date of the vesting in the Council of the gas-works. The limits for the supply of gas will include the district and the parishes of Chetwynd Aston, Chetwynd Rural, Church Aston Rural, Edgmond, and Longford, in the rural district of Newport, in the County of Salop, and the parish of Forton, in the rural district of Gnosall, in the County of Stafford. If after the expiration of five years from the date of the commencement of this part of the Act, the Council have not provided mains for the supply of gas in the parishes of Edgmond and Forton,

the local authority or others may apply for an Act or Special Order for the purpose of providing such a supply, and for the repeal of the powers of the Council. The Council will have three months within which to give notice of the calorific value of the gas they intend to supply. The price to consumers by meter is not to exceed 16d. per therm within the district, and 19d. outside; but the price in the outside area is not to exceed by more than 3d. per therm that for the time being charged within the district. Until the declared calorific value comes into force, the price of gas is not to exceed 6s. per 1000 c.ft. within the district, and 7s. 2d. outside; but the price in the outside area is not to exceed by more than 1s. 2d. per 1000 c.ft. that for the time being charged within the district. The maximum charge for the hire of a prepayment meter and fittings is to be 3·6d. per therm if a cooking stove is included, and 3d. without a cooker. The maximum charge for a prepayment meter without fittings is fixed at 2d. per therm or 10 p.ct. per annum on the cost of the meter, whichever shall be the higher.

[*Parliamentary Agents: Messrs. Lees & Co.*]

DETERMINATION OF SULPHUR IN BENZOLE.

By Dr. W. B. DAVIDSON.

The need for a simple and satisfactory laboratory apparatus for estimating the percentage by weight of sulphur in benzole has been felt for some time by the benzole chemist, and it is this need that instigated the writer to spend a considerable amount of time in endeavouring to overcome the difficulties known to be experienced in carrying out the test.

The burning of the spirit in compressed oxygen in a calorimetric bomb would appear, at first sight, a simple way of determining sulphur. This method, however, is attended by some risk; further, it requires costly apparatus, and, when the sulphur content is small, the precipitate of barium sulphate, obtained in the usual way, is too small to be capable of being accurately determined.

The principle of the method here proposed consists in burning the benzole smokelessly in a current of air in a small burner, and aspirating the products of combustion through a suitable quantity of hydrogen peroxide solution contained in a well-designed wash-bottle. A definite volume of the benzole is burnt for the purpose of this test. The sulphur dioxide formed by combustion is oxidized by the hydrogen peroxide to sulphuric acid, according to the equation

$$H_2O_2 + SO_2 = H_2SO_4$$

and the amount of this acid, finally collected, is determined by titration with standard solution of soda.

Hydrogen peroxide, as sold, usually has an acid reaction. It is necessary, therefore, to neutralize it carefully before introducing it into the wash-bottle. (The method of utilizing hydrogen peroxide for the estimation of sulphur dioxide is, of course, well known.)

It is possible to burn, smokelessly, undiluted benzole in a burner of special design in a rapid current of air; but there is difficulty in doing so in a reliable or satisfactory manner. It is preferable to avoid the difficulty by diluting the benzole with dry, sulphur free, methylated spirit, or other suitable diluent, and thus ensure that the mixture will burn placidly to a finish. A suitable degree of dilution is 20 p.ct. by volume. For example, 20 c.c. of the benzole under test is pipetted into a dry 100 c.c. graduated flask, which is quickly made up to the mark with methylated spirit and well shaken. From this stock-solution, quantities of 10 c.c. at a time are pipetted into the burner reservoir for test.

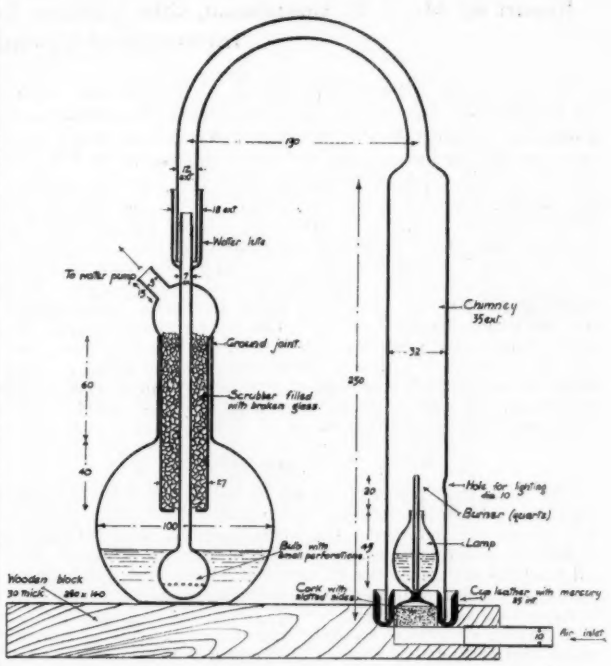
The atmosphere of a laboratory generally contains an appreciable quantity of sulphur dioxide, which would vitiate the test if not eliminated. It is thus necessary to scrub the aspirated air to effect the required purification; and this is conveniently done by drawing it through a scrubber containing loose packing material moistened with caustic soda solution. This scrubber must be of wide dimensions, or such as will not set up a back-pressure of more than one or two tenths of an inch (water column) under working conditions.

If the scrubber is narrow or closely packed, and the air current strong, the back-pressure may be so great as to lead to the breaking of the seal of the water-luted junction of the washing flask. Every gas chemist will understand. A vertical glass tube, not less than 2 in. in diameter and about 5 in. high, filled with sifted broken glass tubing, is recommended.

DESCRIPTION OF APPARATUS.

The whole apparatus is simple, and can be made readily enough by the amateur glass-blower even when using "Pyrex" glass, which is recommended because of its great certainty of resistance to fluctuations of temperature. It is unnecessary to have a wash-flask made of "Pyrex" glass, but no significant additional expense is incurred thereby. The accompanying diagram requires but little explanation. The sizes given are approximate; a large tolerance being allowable. Into a wooden block is fitted, gas-tight, a cup-leather, which provides a lute for the base of the glass chimney; a little mercury being used for making a seal. For conducting the scrubbed air to the chimney base a $\frac{3}{8}$-in. brass tube is screwed into the side of the block. This is connected with the air-scrubber by means of a rubber tubing. A cork shive with slotted rim is fixed inside the cup-leather to serve as a support for the burner; the air passing up through the slots.

The chimney is drawn out into a wide bend which slips over the water-luted glass fitting forming the uppermost part of the compound wash-flask and scrubber. The inlet tube of the flask terminates in a bulb perforated with a number (at least eight) of equal-sized small, round holes about half a millimetre in diameter. The inlet tube carries round it a scrubber filled with broken glass tubing. This scrubber makes a gas-tight ground joint with the neck of the flask, which is of the standard heavy flat-bottomed type with wide neck, preferably somewhat shortened. The object of this scrubber, moistened with hydrogen peroxide solution, is to ensure the oxidation of the last traces of sulphur dioxide. The wide outlet of the scrubber makes connection with an ordinary evacuating water pump.



Pyrex glass.
Dimensions of Lamp: Height 55; diam 25; capacity 15 c.c. approx.
Dimensions of Burner Tube: Height 65; bore 14-16, wall 1.
All dimensions in m.m.

The burner-reservoir is made of "Pyrex" glass, and has a capacity of about 15 c.c. The burner tube is preferably made of transparent silica, and is threaded with a strand of soft, loosely-twisted cotton wick taken from the round wick used for methylated spirit lamps; the strand, after threading, being cut close up to each end of the tube.

MODE OF OPERATION.

About 50 c.c. of hydrogen peroxide (20 volumes) solution, sufficient for two tests, is diluted to about 200 c.c. with distilled water. Three or four drops of methyl orange indicator are added. Normal sodium carbonate is then added slowly until the red colour almost disappears. Then the soda is added drop by drop. The desired neutral tint having been secured definitely—if necessary by the use of decinormal solution of sodium carbonate and/or hydrochloride acid—half of the neutral hydrogen peroxide reagent is poured down the scrubber into the flask, covering the whole of the perforated bulb.

As a preliminary, about half a cubic centimetre of the stock spirit solution to be tested is introduced into the burner reservoir, the tube is inserted, and the wick lighted. This quantity of spirit is allowed to burn itself out in the open. The tube is removed, and an accurate volume of 10 c.c. of the stock solu-

tion is introduced into the reservoir by a standardized pipette made with a curved delivery jet. The tube is quickly re-inserted, and, the chimney being temporarily removed, the complete burner is placed in position and lighted; the chimney being immediately replaced and the water pump started. Alternatively, the lighting-up is effected through the side hole provided in the chimney; the aspiration being for the moment restricted. A tiny methylated spirit burner is employed for kindling, in preference to a match.

For the burning of 10 c.c., a period of 1½ to 2 hours is required, depending on the size of the flame, which, of course, should not be so large as to smoke.

When combustion is complete, and the flame goes out, a space of two or three minutes is given for clearance of the combustion products. The wash-flask is then removed. The scrubber is rinsed out into the flask with distilled water; the water in the lute being emptied and washed out into same. Filtration is effected by means of decinormal (or sixteenth normal) sodium carbonate with the use of three or four drops of methyl orange of the usual strength as indicator.

As the volume of soda solution required is usually only small, it is wise to make use of as fine and accurate a burette as possible for measuring same, capable of reading easily to 0·01 c.c. When the sulphur content is low, it is advisable to burn a further volume of 10 c.c. before titrating.

Numerous check tests made by the author with purest thiophene-free benzene to which known quantities of pure carbon disulphide and/or pure thiophene were added gave perfect results—that is, within the limits of the possible error of titration. An unsatisfactory performance was encountered, however, when check tests were made with purest benzene solutions of known quantities of solid sulphur. At times nearly correct results were obtained; at other times, the figures were only from 70 to 80 p.ct. of the true values, and it was found in these cases that the sulphur did not burn completely, being retained on the wick.

Being unable to find a wick that would allow the sulphur to burn reliably, the author devised a new type of wickless burner-tube, where the wick is replaced by a number (7 to 10) of very fine capillary tubes, preferably made of silica. This kind of burner tube was found to give correct results in all cases. The tube, in this case, should be a little shorter and of slightly narrower bore than the wick-carrying tube—say, 50 mm. long, and rather less than 2 mm. bore.

Transparent silica tubes have the advantage of permanency, being easily cleaned in the blowpipe, after rinsing with methylated spirit.

Paraffin oil naturally burns in the apparatus undiluted. Petrol, on the one hand, and lubricating and insulating oils, on the other, can be examined readily for sulphur percentage by diluting the same with specially prepared paraffin oil (or with nonane) of known very low sulphur content.

STREET LIGHTING IN GREAT BRITAIN AND AMERICA.

Report by Mr. J. F. Colquhoun, City Lighting Engineer, Sheffield, on the Seventh Meeting of the International Commission on Illumination.

We have been favoured with Mr. J. F. Colquhoun's report on the Seventh Meeting of the International Commission on Illumination, which took place in New York from Sept. 22 to 28, 1928, and an account of which was published in the "JOURNAL" for Nov. 14 last, p. 466 *et seq.* Prior to the meeting the delegates visited several American cities. On Sept. 6 the Edison Lighting Institute, Harrison, New Jersey, was inspected; and Mr. Colquhoun mentions that the visitors saw, among other interesting things, a model street which was said to be the actual model of the principal street of Newark. The buildings, roadway, footpaths, lamp standards, and fittings are all made exactly to scale. The model street is only ten yards long, but it contains no less than five miles of wire; and 282 different street lighting installations can be shown. Tiny traps are made in the footpaths, and model lamps appear and disappear, all controlled by electricity from a switch-board. This particular model cost $6000.

VALUE OF MODEL STREETS.

The delegates saw several of these model streets in the various laboratories throughout America, and many wonderful effects are obtained. Different kinds of floodlighting of buildings in white light and in colour can be demonstrated; all kinds of sky and other illuminated advertising signs can be exhibited; different kinds of road surfaces can be shown to demonstrate the effect of their varying reflecting qualities on visibility in a street. Twilight and moonlight can be shown; stars appear and disappear. The appearance of rainfall from gentle showers to a deluge was given, and finally the visitors were treated to a very realistic thunderstorm. This, it was explained, was in order to demonstrate all the different climatic conditions under which street lighting is used.

The model streets, writes Mr. Colquhoun, are very clever pieces of workmanship, and no doubt are a great aid to American salesmanship. They are useful for demonstrating particular types of street lighting fittings, and are helpful in studying the art and science of street lighting; but there is general agreement with the opinion that results would require to be further tested in actual full-scale installations.

ABSENCE OF GAS LIGHTING.

"We saw no good gas lighting in America," states Mr. Colquhoun. "This may be due to the fact that in many cases gas and electricity are under the same financial control, and that electricity has been given the lighting field; but it is surprising that what gas lighting there is is so inefficient and out of date. A very few inverted mantles are in use, but we did not see a single preheated inverted burner."

Mr. Colquhoun was greatly impressed with the magnitude and completeness of the laboratories of the General Electric Company of America at Nela Park. In connection with the work of the laboratories, a nearby street has been fitted up with no fewer than 40 different street lighting installations. This is an endeavour to try on a full scale some of the experiments carried out in the model street forming part of the laboratory equipment. It is a most valuable piece of research work; though Mr. Colquhoun is of the opinion that the demonstration recently held in Sheffield (see "JOURNAL" for July 18; p. 144) leads one to more dependable conclusions, because of the greater variety of conditions under which that demonstration was carried out.

DIFFERENCE BETWEEN AMERICAN AND BRITISH PRACTICE.

The report goes on to say that, from inspection of the street lighting of the cities visited, it is evident that there is a considerable difference in the American and British points of view on this matter. The lighting engineers, in the employment of the manufacturers of street lighting plant, naturally give more attention to installations of spectacular lighting in the chief streets than they do to the lighting of the less important streets and roads in residential areas. The cost of the spectacular lighting is usually borne by the merchants, or other interested parties. In these cases, the first consideration in the choice of fittings is appearance; and the high degree of illumination is obtained by expenditure of electrical energy. There is no want of light, but the primary consideration is decorative, and the orders for street lighting equipment are placed with the objective of increasing the attractiveness of the street, and so bringing more prospective customers to it. It would appear that the arrangement is satisfactory to the merchants, as the system is common in American cities.

The effect is that street lighting in the United States is considered more from the artistic than the scientific point of view; and, in consequence, the lighting of streets other than those specially dealt with at the expense of the merchants is below the standard considered necessary in Great Britain. In American practice, considerable importance is attached to daylight appearance of the street lighting plant.

In many cases, Mr. Colquhoun explains, the lamp pillars are made of concrete, but have the appearance of granite; and the ornate lighting fixtures add to the architectural beauty of the streets. Possibly British practice has given less consideration than is advisable to this aspect, and has devoted entire time and thought to efficiency of illumination. In America the art of street lighting has been closely studied; in Britain the science is studied and the art neglected.

SHOPKEEPERS AND GOOD LIGHTING.

It is apparent that the shopkeepers in America realize the attractiveness of good street lighting much more clearly than do the shopkeepers in this country. They are willing to pay for ornate and expensive installations—the cost presumably being charged to their advertising account.

In almost all the cities visited, the street lighting is done by the local gas or electricity company, working under a contract with the city; but there is no doubt that the British practice of the municipalities undertaking this work for themselves results in a much better service to the respective communities.

There is a uniformity in the lighting of British cities which is lacking in America. Our best lighting is not as good as—indeed, is not comparable with—the best in America; but much more attention is paid in Britain to the lighting of residential areas than is the case in similar areas in America. It must be remembered, however, that many of the arterial roads in America are lighted, and that similar roads in Great Britain are unlighted.

KOPPERS CONTINUOUS VERTICAL CHAMBER OVEN INSTALLATION AT THE WORKS OF THE CHAPEL, WHALEY AND DISTRICT GAS COMPANY.

In November, 1926, the Board of the Chapel, Whaley and District Gas Company, having decided to replace their existing works at Chapel-en-le-Frith and Whaley Bridge by a modern plant, placed with Koppers Coke Oven Company the order for the first installation of Koppers continuous vertical chamber ovens in this country. This installation, which was erected at a new site at Horwich End, Whaley Bridge, commenced making gas in June, 1928.

The Koppers plant differs in several important particulars from other types of vertical retorts and vertical chamber ovens now in the market, and possesses important advantages. Before describing in detail the new works, a brief summary of the particular features of the Koppers system will be given.

CARBONIZING CHAMBER.

The carbonizing chamber is of large dimensions, so that the economies of carbonization in bulk are secured, together with the additional advantages accruing from the continuous passage of the coal through the retorts. For a given capacity of the installation, a minimum number of units is required—a feature which reduces the labour involved in the supervision and control of the plant. For the operation of these large carbonizing chambers there are of necessity fewer fittings than would be required in the case of smaller retorts, so that the work to be performed by the operators is reduced to a minimum. The employment of large chambers is found to result in the production of a large coke of improved strength. The amount of breeze made is exceedingly low, and all of it can be used in the central producer plant. In spite of the large capacity of the unit, it is possible to vary production within wide limits without difficulties and without undue loss of efficiency.

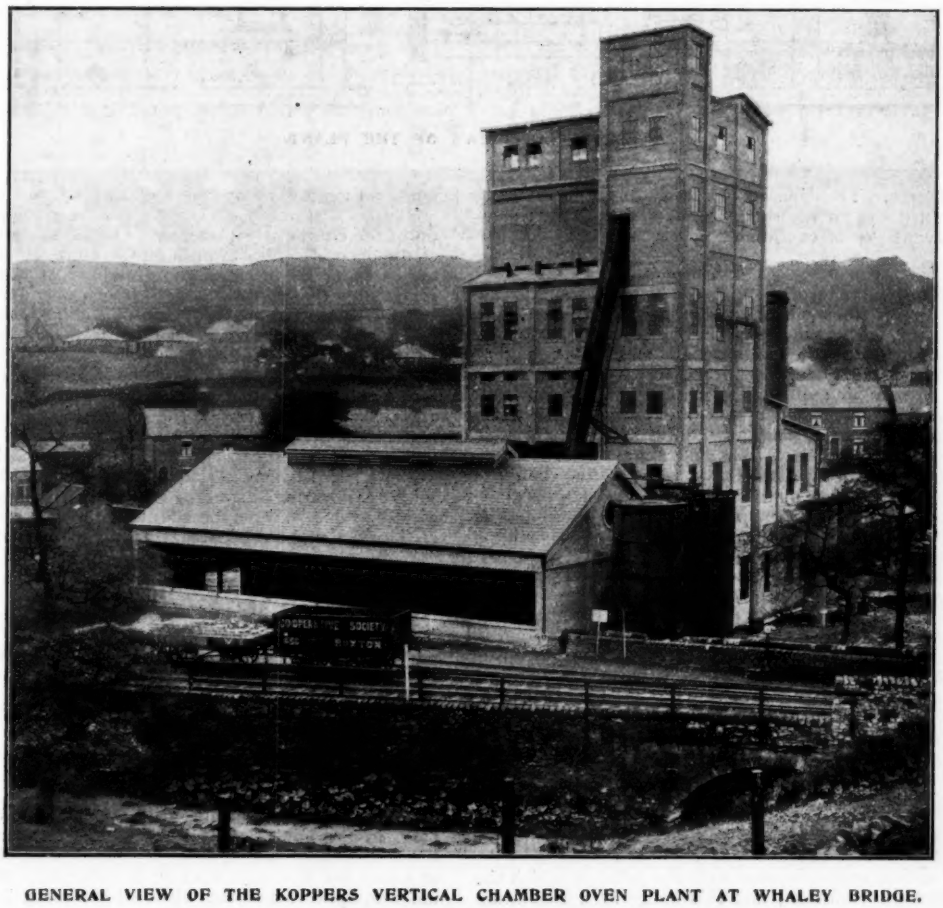
COAL CHARGING ARRANGEMENTS.

The second advantage lies in the special construction of the feeding arrangement for charging the coal to the ovens. Particular attention has been directed to eliminate the difficulty of sticking of the charge. The effectiveness of the method adopted is demonstrated by the circumstance that Durham and other admittedly " difficult " coals have been successfully treated over long periods of operation. This desirable result is secured by admitting the coal to the oven through a rectangular cast-iron fitting of somewhat smaller sectional area than the chamber, and which projects so far into the chamber that, at the point where the coal first comes into contact with the brickwork, the temperature of the oven walls is well over 1000° C. Under these conditions a hard skin is rapidly produced upon the surfaces of the coal adjacent to the wall, so that the coal does not stick to the brickwork.

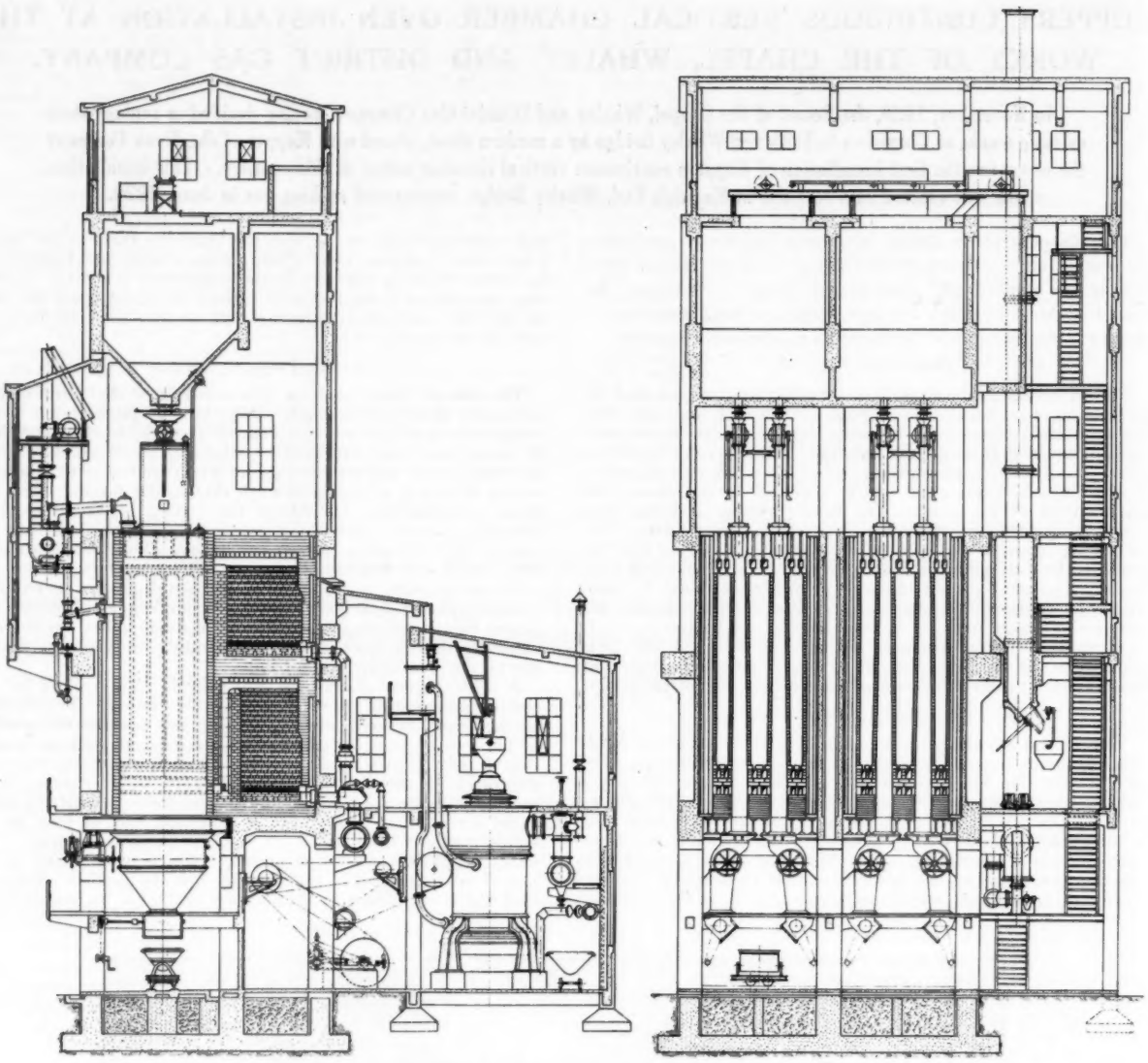
CLEAN PRODUCER GAS.

The use of clean producer gas constitutes the third special feature of the Koppers plant. With built-in producers it is impossible to avoid the impingement on the brickwork of the flues of ferruginous dust, frequently containing much alkali, carried mechanically in the producer gas. The result of such contamination is fusing of the brickwork due to the fluxing action of these constituents. The life of the setting is, therefore, considerably greater when clean producer gas is used than in the case of settings with built-in producers. The prolongation of the life of the settings far more than compensates for the additional expense necessitated by the installation of an external producer plant; and, since highly efficient regenerators are employed for extracting the heat from the waste gases, the thermal efficiency of the plant is not detrimentally affected by placing the producers outside the setting.

A high degree of thermal efficiency is also secured by the complete insulation provided around the setting. The heating of the ovens by cold, clean producer gas permits the placing of the central producer plant at any convenient position in relation to the carbonizing plant, and also makes possible the exact regulation of the quantity of gas to each set of heating flues, securing at the same time perfect combustion with the minimum quantity of excess air, so that the loss of heat in the waste gases is reduced to the smallest possible amount. The exact regulation of the combustion which is obtained by the use of producer gas in this manner has the further advantage that the temperature in the heating walls can be regulated to



GENERAL VIEW OF THE KOPPERS VERTICAL CHAMBER OVEN PLANT AT WHALEY BRIDGE.



SECTIONAL VIEWS OF THE PLANT.

any desired degree. The capacity of the plant can therefore be adjusted to suit the required production of gas, without jeopardizing the advantages of continuous operation.

REGENERATORS.

The system of heating embodied in the Koppers design comprises a further special feature of the Koppers plants. The producer gas supplied to the ovens, as has just been stated, is cold; and in order to obtain the necessary temperature and to secure properly efficient working, it is necessary to pre-heat both the gas and the air required for combustion. The method of pre-heating is by regenerators of the type originally applied to Siemens furnaces, and now universally employed in regenerative coke ovens. Both gas and air are pre-heated to a high degree, usually over 1000° C., in regenerative chambers filled with chequerwork. On this account, a high flame temperature is obtained in the heating flues, thereby leading to rapid carbonization and consequent high carbonizing capacity of the ovens.

Separate regenerators are provided for pre-heating air and gas, and these regenerators are separated from each other by heavy brick walls, so that no short-circuiting can occur between the air and the heating gas. Attention may also be drawn to the fact that, in addition to the security provided by substantial division walls, the pressure difference between regenerators working on air and those working on producer gas is negligible. The occurrence of leakage between the air and waste gas passages, which is a recognized disadvantage of recuperators, is rendered impossible in the Koppers system by the position occupied by the regenerators in the setting.

METHOD OF HEATING.

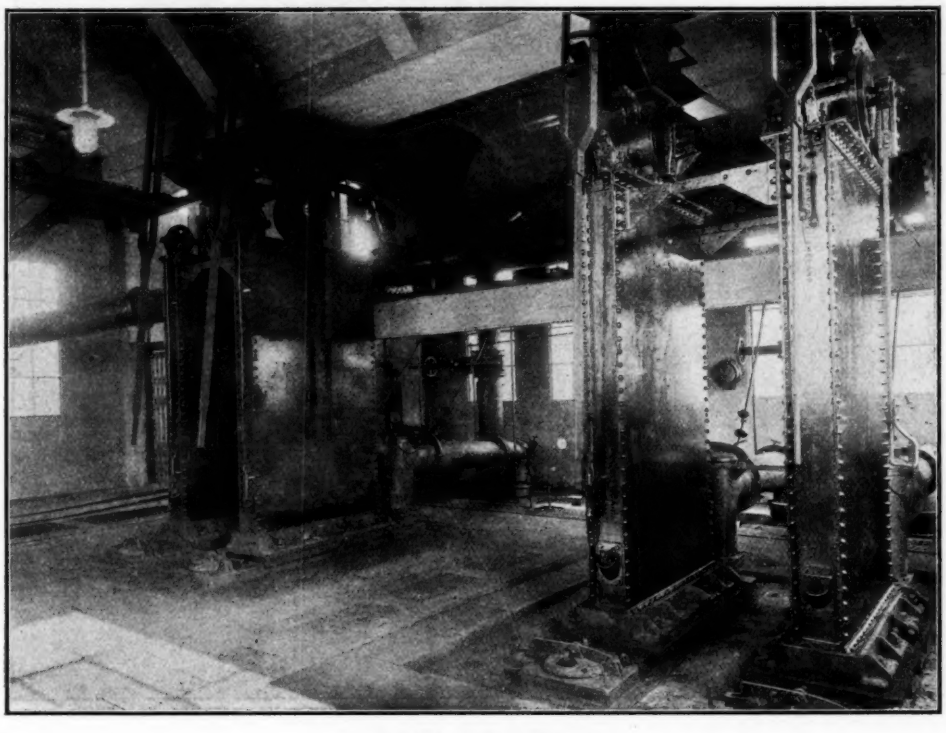
The oven chambers are heated alternately for half-hour periods from the bottom upwards and from the top downwards. The top combustion zone coincides with the point at which the coal first enters the chamber; and this being at a maximum temperature, the outer layers of the coal are very quickly carbonized. A skin of coke is thereby formed, so that no hanging-up of the charge is experienced. At the same time, the bottom of the oven is kept at a high temperature, thereby enabling the oven to produce the maximum quantity of water gas from the steam admitted at the base of the chamber for that purpose.

The reversal of the direction of combustion every half-hour has an important effect in prolonging the life of the brickwork. It is a well-known fact that, when a flame burns in contact with brickwork, the surface of the brickwork exerts a catalytic action upon the combustion, so that no inconsiderable quantity of heat is generated within the superficial pores of the refractory materials. In such circumstances, fluxing of the skin occurs, and the life of the bricks is materially shortened. Where, however, half-hourly periods of rest are afforded, as is always the case in settings arranged on the regenerative principle, sufficient time is given for the additional heat located at the surface of the brick to be dissipated, so that skin fluxing is avoided.

GROUND SPACE AND LABOUR.

The ground space occupied per unit of carbonizing capacity is naturally exceedingly low, on account of the large throughput of the chambers. This has not been a consideration of particular moment in the case of the Chapel, Whaley and District Gas Company's Works; but where a maximum carbonizing capacity upon a given ground space is desired, this may be regarded as one of the decided advantages possessed by the Koppers plant.

The labour required for the operation of the Koppers plant is exceedingly low, since practically the whole of the operation of both ovens and producers is automatic. The principal operations consist in the charging of the coal to the measuring chambers, in the withdrawal of the coke from the hoppers below the ovens, and in charging the producers. The temperature at which the workmen operate is little above that of the external atmosphere, and the whole of the plant is free from dust



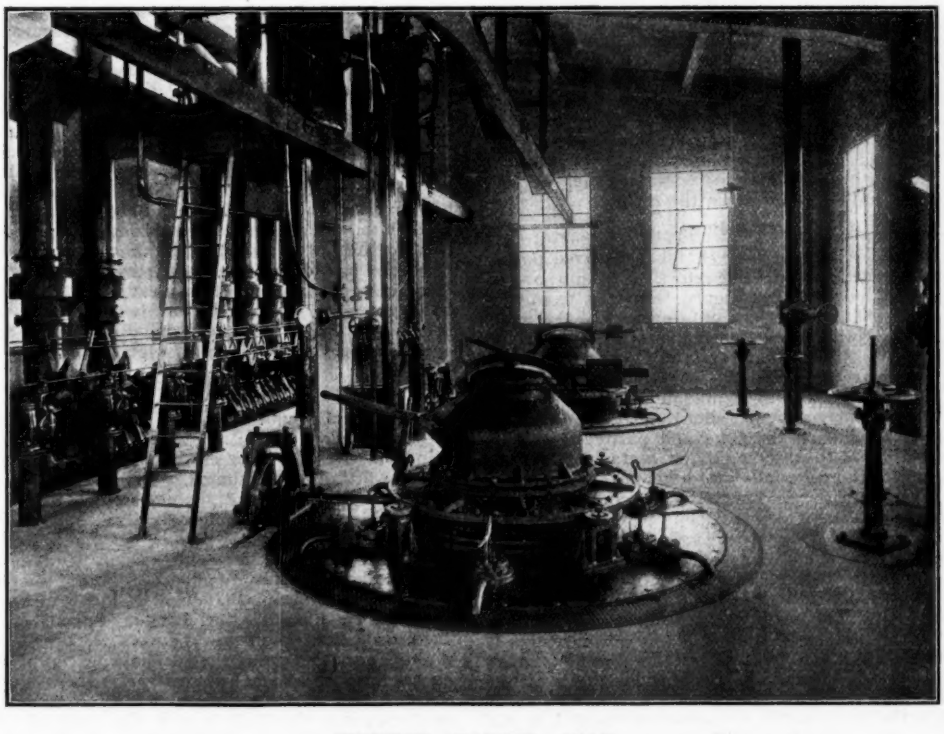
CHARGING STAGE.

and fumes. A squad of three men per shift can operate a plant carbonizing up to 100 tons of coal per day.

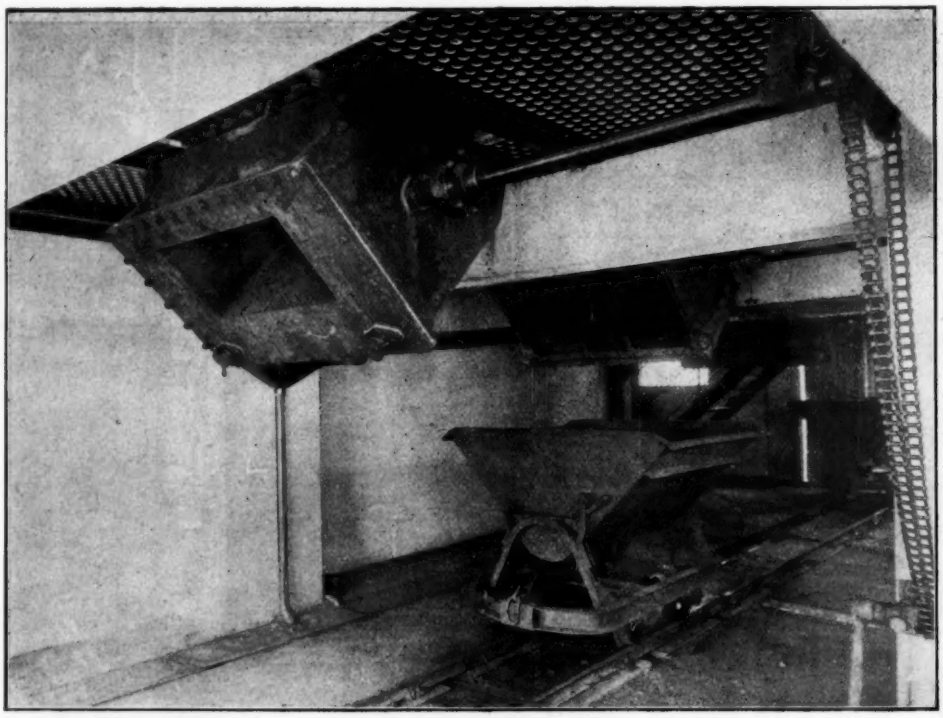
The Whaley Bridge Plant.

The Koppers continuous vertical chamber oven installation at Whaley Bridge comprises two units each consisting of two chambers, making four chambers in all, complete with the necessary producer plant, coal stores, coal handling plant, gas exhausters, washers, purifiers, station meter, and holder. Each chamber has a daily carbonizing capacity of 10 to 12 tons of South Yorkshire coal; the whole plant being able to produce 800,000 c.ft. of gas per day of a calorific value of 480 B.Th.U. per c.ft. The chambers are 30 ft. in height, 8 ft. 4 in. in length, and 13¾ in. in width at the top. Each unit is self-contained and is enclosed in a ferro-concrete casing in which suitable provision has been made for any slight expansion that may occur, though the materials of which the concrete is composed have been specially selected so that the expansion is nearly negligible, and the housing is of such a nature that it will readily withstand a moderate degree of heat. The concrete casing is lined with insulating bricks; and on account of the double insulation thus provided, the amount of heat lost by radiation is reduced to a minimum. The insulation of the setting is one of the most important features of the Koppers plant.

Since the two units are independent, the fullest facilities are available for operating the plant to suit varying requirements. The heating arrangements are such that the chambers can be worked at greatly reduced rates of carbonization; and even with a load of only 50 p.ct. of the maximum, the efficiency of the plant is not affected. The plant is arranged so that, if



PRODUCER CHARGING STAGE.



COKE DISCHARGE EQUIPMENT.

necessity should arise, coal gas can be used for heating the setting. In this way, the fullest advantage can be taken of all possible conditions of the coal and coke markets and of gas requirements.

COAL HANDLING.

The coal used on the plant arrives in railway wagons, from which it is unloaded by hand on to a shaker screen, for elimination of the coal below ¾ in. The fine coal passing through the screen is discharged to the elevator boot, while the large coal passes through a coal breaker before being discharged into the boot. The building in which the screen, coal breaker, and elevator pit are situated is constructed of concrete and has a floor area of 3300 sq. ft.; this building serving also as a coal store. The coal can be unloaded directly from the wagons into the stores, and can, when required, be put on to the screen by means of a short elevator.

Normally the crushed coal is conveyed to the top of the building by a bucket elevator, and is there distributed by a push-plate conveyor into the service hoppers, which have a total capacity of 100 tons. To cope with emergency, however, provision is made for the coal to be conveyed to the hoppers in side tipping wagons which are elevated in an automatic lift. Two service hoppers are installed, each of which is sub-divided into two compartments. From the service hoppers, the coal falls by chutes through a coal valve into measuring chambers. Each of the latter holds about 7 cwt. of coal, and is provided with indicating floats, in order that the operators may be able to follow the progress of the coal down the retorts.

THE CARBONIZING PLANT.

At the lower end of the measuring chamber the coal passes through a metal sleeve and into the retort. The purpose of this metal sleeve, as has been mentioned before; is to ensure that the coal is brought immediately into contact with the walls of the chamber at a point where the temperature is high, so that a skin of coke is immediately formed upon the coal, and sticking of the charge is avoided. At the lower end of the chamber, the coke passes through an automatic extractor, around which steam and water are admitted; the purpose of these being partly to quench the coke and partly to provide the steam necessary for the production of water gas. After passing the extractor, the coke falls into a hopper, whence it is discharged at intervals through a water-sealed valve into side tipping wagons.

The gases evolved from the coal leave the retort through an ascension pipe, and by means of a short length of pipe pass into the collecting main, whence they are conveyed by a foul main to the purification plant. A separate collecting main is provided for each unit. The water gas generated at the bottom of the ovens may take the same course, but in certain cases it is found desirable to allow it to escape from the oven by another outlet, for which purpose an auxiliary ascension pipe is placed about one-third of the way down the oven. The water gas, if taken off through the lower outlet, subsequently passes into the collecting main, where it mixes with the remainder of the coal gas. The gases in the collecting main are cooled to temperature of 120° Fahr. by means of atomized sprays of ammoniacal liquor. This practice has been found by experience to result in the elimination of chloride salts from the tar, and has the additional advantage that any of the heavy portions of the tars deposited in the main are accompanied by a sufficient quantity of light tar always to render them fluid; pitching-up of the mains being thereby prevented. The suction on the retort is governed by an "Arca" regulator situated on the foul main.

The heating of the ovens is effected, as has been mentioned before, by cool and clean producer gas made in a central producer plant, which will be described subsequently. The fuel gas from the producer plant passes to the heating gas main and through a series of pipes fitted with regulating and reversal cocks into special valve castings at the bottom of the regenerators. The air for combustion also passes through similar valve castings into the air regenerators. Gas and air are pre-heated in separate regenerators to a temperature of about 1000° C. and are delivered by separate flues to the burners situated at the base of the flues. After combustion, the gases enter the top of the upper regenerator, pass down through this regenerator, and thence to the waste gas main, having given up their heat to the chequer-work in the regenerator. From the waste gas flue the gases are drawn by a fan into the chimney. On account of the low temperature at which the waste gases leave the regenerators, there is no need for the installation of waste-heat boilers. At the expiration of half-an-hour, the direction of the flow of the gases is reversed, so that the air and gas enter through the upper regenerators, pass to the burners situated at the top of the flues, and burn from the top of the flue downwards; the lower regenerators now being used to extract the heat from the burnt gases. The advantages of this system of heating have been discussed previously. For reversing the direction of combustion, the ovens are provided with a suitable winch.

THE PRODUCER PLANT.

The central producer plant is arranged in close proximity to the carbonizing plant; the charging stage of the producers being on the same floor as that on which the gas and air admission fittings are situated. The breeze is taken to the producer plant in bogies, is elevated by the hoist and delivered into the fuel bunker. The bunker is divided into three compartments to permit the nuts, breeze over ⅜ in., and dust below ⅜ in. being separately stored. The fuel bunker has a capacity of about 48 hours' supply. The breeze is discharged from the bunker into runway bogies, and propelled by hand to the charging hopper of the producers. Two Koppers mechanical producers are provided for supplying the fuel gas for heating the carbonizing chambers. These producers have an internal diameter of 7 ft. and are arranged for the gasification of coke breeze and inferior fuel. One of these producers is sufficient to provide the whole of the gas required for double the plant so far installed; the second being a stand-

by. The rated capacity of each producer is 14 tons per day, but the Koppers system allows so wide a latitude of throughput that as low as 27 cwt. of fuel has been dealt with in 24 hours without difficulty, and with the production of a gas of satisfactory quality.

The Koppers producer possesses many features of particular interest, and a brief description of this plant will now be given. The producer can successfully gasify breeze containing a comparatively large proportion of dust coke. It is provided with a water jacket, designed in the form of a low-pressure steam boiler, by means of which all the steam required for the gasifying operations, as well as a surplus for other purposes, can be generated, and the producer is therefore specially suitable for gas-works requirements.

The Koppers gas producer, as will be understood from the diagram, is constructed on the well-known revolving grate principle, and is provided with mechanical means for automatic removal of the ash. A special feature of the producer is the provision of a revolving feed arrangement for admitting and regulating the supply of fuel, which at the same time serves to maintain uniform gasifying conditions inside the producer. The feed arrangement consists of a preliminary charging chamber (A) furnished at the bottom with a discharging bell (B), by means of which a definite quantity of fuel can be fed into the subjacent secondary chamber (C) at required intervals, whence it passes automatically into the producer as the fuel is consumed. The latter chamber is furnished on the outside with three wing chutes (D) which, as the feed arrangement revolves, always maintain an even surface of the charge in the producer, and prevent channelling. The upper portion of the producer is lined with fire-resisting material, but the lower portion, for the whole height of the gasifying zone, consists of a water-jacket (E) which, as already mentioned, is designed for the generation of steam. In the past, difficulties have been experienced with water-jacketed producers, for it was found that the internal shell became rapidly corroded away. As a result of experiments and investigations, it was ascertained that the corrosion was caused by the deposition of water from the blast, due to the low temperature of the water in the jacket. In the Koppers' producer, a combined water tank and steam collector (F) is placed at an elevation above the producer, from which connections are made in such a way that a continuous circulation takes place by simple convection. The water in the jacket is continually under pressure, and it is accordingly easily possible to maintain the temperature of the water in the jacket at slightly over 100° C. Owing to this provision, condensation is avoided and corrosion of the plates of the shell is entirely obviated.

The mechanical ash-discharging arrangement consists mainly of a conical hearth (G) combined with an ash-collecting pan (H), which latter forms a water seal for preventing the escape of gas. The hearth is also out of centre, the effect of which is to prevent formation of clinker and consequent holding-up of the fuel bed. The ash is automatically removed from the pan (H) by means of ploughs, and is delivered directly into bogies for transport to the waste heap.

The producer fuel dealt with at the Whaley Bridge plant is of the size shown by the following screen analysis:

Above 1½ in.	14·3 p.ct.
1 in.–1½ in.	10·3 ,,
¾ in.–1 in.	10·8 ,,
½ in.–¾ in.	35·0 ,,
¼ in.–½ in.	13·7 ,,
Below ¼ in.	15·9 ,,

It is, however, possible to deal with fuel smaller than this with equal satisfaction.

The composition of the producer gas is as follows:

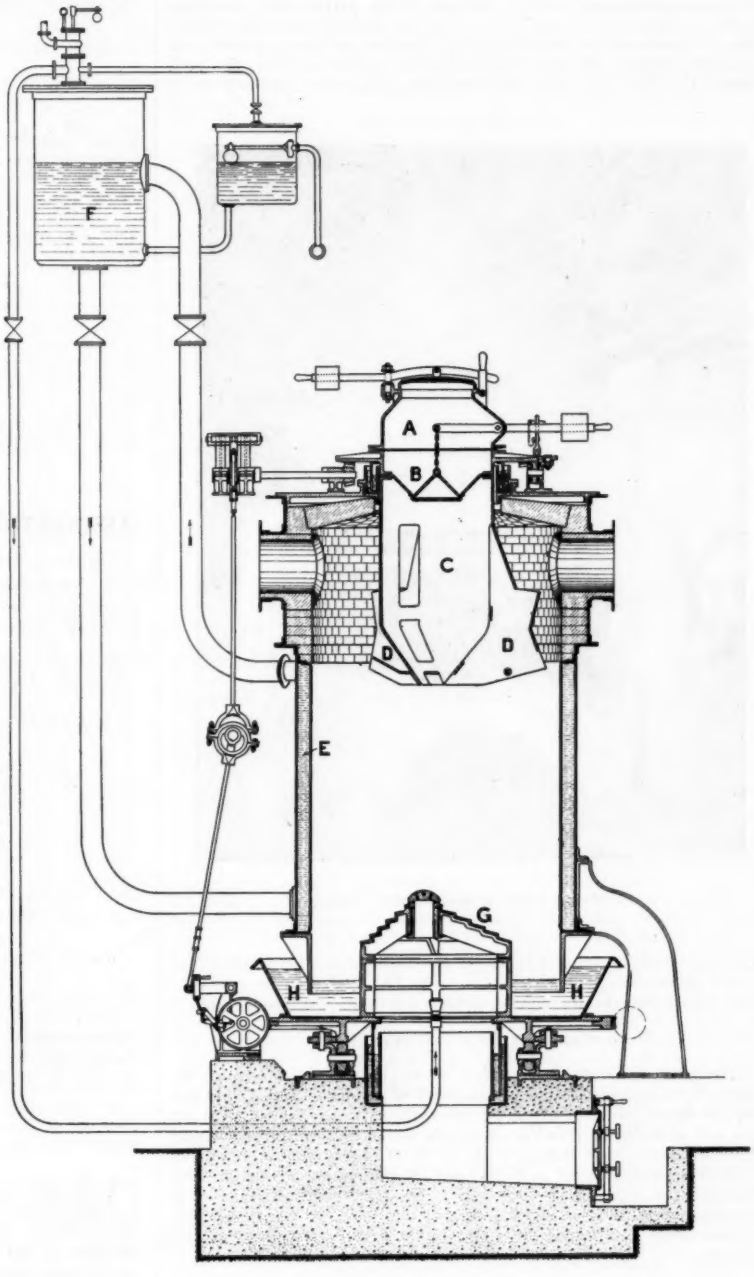
CO_2	4·0 p.ct.
CO	27·0 ,,
H_2	8·0 ,,
CH_4	0·4 ,,
N_2	60·6 ,,
	100·0 ,,

The calorific value of this gas is 116 B.Th.U. per c.ft.

The blast for the producers is obtained by fans, and during its passage to the producer is pre-heated to a temperature of 135° Fahr. by the addition of a portion of the low-pressure steam generated in the producer jacket. The gas made in the producer passes through the pipe mains into the scrubber, where it is cooled and cleaned by means of water sprays. From the washers the cooled and cleaned gas passes to the heating gas main. In order to obtain uniform gas pressure in the latter main, a special air blast regulator is included in the producer plant.

The Gas Purification Plant.

The gases from the retorts, after passing into the hydraulic main, as mentioned previously, are conveyed by a foul main to the inlet of the condensing plant. Four annular condensers



SECTION OF THE KOPPERS PRODUCER.

of the air-cooled type are installed having an external diameter of 4 ft., with inner shells of 3 ft. diameter; the height being 20 ft. These condensers are fitted with 16-in. inlet and outlet valves, and suitable arrangements for by-passing. Connections have been arranged for the addition of a water-tube condenser when required.

Two direct steam-driven exhausters are installed, each of the four-bladed type, 27 in. by 27 in., and rated to pass 30,000 c.ft. of gas per hour at a speed of 60 R.P.M. One of these exhausters is by the Bryan Donkin Company, and the other by Messrs. R. & J. Dempster, Ltd. The wet purification plant consists of a Livesey washer of a capacity of 750,000 c.ft. per day, followed

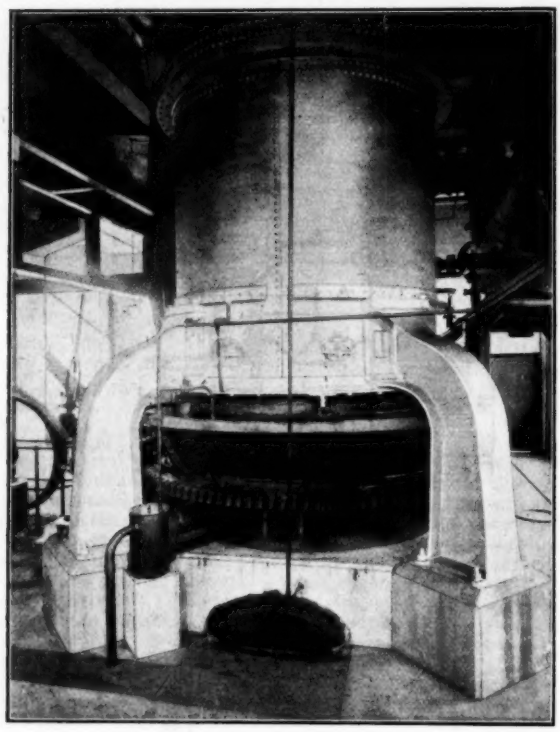
by a Holmes rotary scrubber washer in two sections having a capacity of 1,250,000 c.ft. per day.

In connection with the dry purification plant, two new boxes, each 25 ft. by 25 ft. by 5 ft. 6 in., fitted with a 16-in. Weck valve, have been laid down; it being estimated that these will be sufficient for the present needs. The Weck valve is, however, arranged to work a further two boxes when required in the future. Two smaller boxes, 24 ft. by 12 ft., taken from the old works, are installed to act as catch boxes.

The station meter is of the Connersville type supplied by Messrs. W. C. Holmes & Co., Ltd., and possesses a nominal capacity of 60,000 c.ft. of gas per hour.

STEAM AND POWER PLANT.

Steam for the operation of the plant is generated by means of two Lancashire boilers, each 24 ft. by 7 ft. 6 in., working under a pressure of 120 lbs. per sq. in., and fitted with "Turbine" furnaces for breeze firing. Power for driving the coal breaker, jigger, elevator, the subsidiary elevator from the coal store, the lift, and the coke breaking plant is obtained by a



Revolving Grate of the Koppers Producer.

50-KW. dynamo manufactured by the Lancashire Dynamo Company, generating current at 220 volts D.C., driven by a Galloway horizontal steam engine of their patent "Uniflow" type.

TAR AND LIQUOR STORAGE.

Two vertical cast-iron tanks, 10 ft. in diameter and 30 ft. high, have been installed for storage of tar and liquor. At the top of these tanks is fitted a cast-iron separator for separating the tar and liquor flowing from the collecting main. A small reinforced concrete tank, 7 ft. by 7 ft. by 5 ft., is used for collecting wash-liquor and seal pot overflows prior to pumping through the separating tank which lies between the two vertical main storage tanks. Arrangements are made to pump tar and liquor from the tanks into the buyer's tank wagons on the siding.

GASHOLDER.

In addition to existing holders on other sites, a new two-lift spiral-guided holder in a steel tank has been erected at the new works by Messrs. R. & J. Dempster, Ltd. The tank is 92 ft. 10 in. in diameter, the outer lift is 90 ft. 6 in., and the inner lift 88 ft. by 21 ft. 6 in. deep. The capacity of the holder is 251,000 c.ft. The tank rests on a concrete foundation 2 ft. thick at the centre, radiating to 1 ft. 6 in. at the edge, reinforced by "B.R.C. No. 9" fabric. The connections to the holder are 16 in. inlet, 18 in. outlet, and 12 in. by-pass. The total storage capacity of the Company is 450,000 c.ft. An 18-in. station governor of the Parkinson equilibrium type controls the main supply to the district.

New offices and showrooms, with workshops below, have been erected alongside the Manchester-London main road.

WORKING RESULTS.

The operating results of the new gas plant have been such as to support fully the advantages claimed for the Koppers system of carbonization. The coal carbonized has consisted principally of normal South Yorkshire and Derbyshire gas coal containing approximately 7 p.ct. of ash and 4 p.ct. of moisture. The average calorific value of the gas has been maintained at 480 B.Th.U. per c.ft. Much of the time that the plant has been in operation has been occupied with conducting experiments with a large number of coals, in order to ascertain the best mixture to use for gas-making, having regard to operating results and to price. The working results to date do not represent the best of which the plant is capable, since certain of the coals used have been found to be much inferior to others from a gas-making point of view, and in no one month has coal of the best gas-making quality been used exclusively.

Month.	Coal Carbonized. Tons.	Total Gas Made. C.Ft.	Gas Made. C.Ft. per Ton.	Therm Yield.
July, 1928	269	4,860,000	18,066	86·7
August, 1928 . . .	237	4,397,000	18,552	89·1
September, 1928 . .	270	4,986,000	18,460	88·6
October, 1928 . . .	351	6,482,000	18,467	88·6

The average composition of the gas is as follows:—

CO_2	1·8 p.ct.
C_mH_n	2·2 ,,
CO	19·7 ,,
H_2	56·0 ,,
CH_4	18·0 ,,
N_2	2·3 ,,

It is hoped to publish complete working results as soon as these are available.

ASSOCIATION OF PUBLIC LIGHTING ENGINEERS.

The Hon. Secretary of the Association, Mr. W. J. Liberty, has forwarded the following programme of the meeting of the Association which is to take place at the British Industries Fair, Birmingham, on Feb. 21 next.

Morning.—Inspection of the Fair.

1 p.m.—Luncheon in the Conference Hall, by arrangement with the Gas Industries Section.

2.30 p.m.—Meeting in the Conference Hall, to see some lantern slides from photographs taken by the President (Mr. J. F. Colquhoun, City Lighting Engineer, Sheffield) during his recent visit to the United States, in connection with the International Commission on Illumination. The slides illustrate American street lighting practice; and it is hoped that time will permit of a short discussion.

At this meeting it is hoped to outline the arrangements for the Sixth Annual Meeting and Conference and Exhibition of Public Lighting Appliances to be held at Bournemouth in September.

4 p.m.—Meeting of the Council.

SIXTH ANNUAL MEETING, CONFERENCE, AND EXHIBITION, BOURNEMOUTH.

At a recent meeting of the Council of the Association, it was confirmed that an Exhibition of Public Lighting Appliances should be held in connection with the Annual Meeting and Conference at Bournemouth on Sept. 9-12 next.

Covering Pipes in Situ.

A machine described in the "American Gas Journal" has recently been perfected for covering pipes already installed which must remain in service while being treated. The machine is specially intended for covering long lines of welded or screwed pipe. The parts of the machine which encircle the pipe are split, somewhat after the fashion of a split pulley; and this permits the machine to be moved over valves, flanges, or short-radius bends, by merely displacing a few bolts. The device is operated by electric motors, current for which is produced by a generator mounted on a motor truck, which accompanies the pipe-covering machine—a cable connecting the generator with the motor. The machine is moved forward by means of two rubber-tyred wheels, which engage the top of the pipe. It is also equipped with two wheels, one operating on each side of the trench. There is an electric heating element for the pipe coating, which is applied to the pipe just ahead of the wrapping material. Three men working on the pipe-covering machine and two men on the truck carrying the electric generator will complete from 800 to 1000 ft. of pipe wrapping per day.

SCOTTISH JUNIOR GAS ASSOCIATION (EASTERN DISTRICT).

Twenty-Fifth Anniversary Dinner.

On Saturday, Dec. 15 last, in the Gainsborough Hall, Edinburgh, the Eastern District of the Scottish Junior Gas Association celebrated its Twenty-Fifth Anniversary by a dinner followed by dancing.

Mr. ROBERT J. GAVIN (Kirkcaldy), the President, occupied the chair, and extended a welcome, on behalf of the Council. The presence of so many of the seniors and honorary members was very encouraging, he said; and he took the opportunity of expressing the gratitude of the Juniors for their kindly interest in the past. He referred to the presence of Mr. John Murray, the President, and Mr. A. Bujnowski, the Hon. Secretary, of the Western District of the Scottish Junior Gas Association.

After the Loyal Toast had been honoured,

THE PROGRESS OF THE INDUSTRY.

Mr. H. H. GRACIE (Engineer and Manager, Edinburgh) proposed the toast of "The Gas Industry." He said it was an industry which had increased and multiplied year by year, spreading its wings over most of the civilized world, bringing brightness, warmth, and comfort to millions. It was one of the key industries of the nation. It had opened the door to progress, and had recoiled like a bolt from the blue on those who had tried to bar its way. It had proved its worth and reliability during war and peace. It had served the community faithfully and well through many strikes, disturbances, and upheavals, and could truly be referred to as the "light that never failed," especially in a crisis. Its importance could be gauged from the fact that there were over 36 million people in the British Isles depending upon it daily for their food and warmth. In Great Britain the industry gave employment, in the manufacture and distribution of gas, to about 120,000 people, besides assisting towards the employment of thousands of other workers.

GAS IN AMERICA.

Mr. J. W. NAPIER (Engineer and Manager, Alloa), who replied, said that Mr. Gracie had spoken of the progress of the gas industry in this country. He himself had recently enjoyed the privilege of taking part in an industrial tour of the United States, and he noticed the great advances made by gas undertakings in many of the great cities of America. For example, in Chicago gasholders had been erected as follows: In 1924, a 10-million holder; in 1926, a 15-million holder; and in 1928, a 20-million holder. In order to meet the yearly increase of about 10 p.ct. in gas output, a 48-in. main, 33 miles in length, had been laid round the city. The sale of gas in Chicago had doubled in about sixteen years. The prepayment meter was almost non-existent in America. The working man preferred to pay his gas accounts monthly. He had been impressed with the fact that the rapid increase in the industrial demand, as also in the domestic load, was due to the system of rate charges. The flat-rate system of charge was considered as being long out of date. The idea of the rate of schedules was to extend the economically correct rate-making principles for developing a "wholesale" business, especially in the field of industrial use of gas. And this, when consistently applied, tended to reduce rates to the "retail" or domestic user. The system of rate charging had revolutionized gas sales in America. The rate principles increased the diversity, volume, and all-round strength of the business. The great apartment buildings were "master-metered." To the owner of the building, the cost of gas used by the tenants would be covered in the rent.

THE ASSOCIATION: PAST AND PRESENT.

Mr. JAMES DICKSON (Engineer and Manager, Dundee), proposing the toast of "The Association, Past and Present," said that his first duty was to thank the President and Members of the Council for providing him with the opportunity of speaking to the members of the Eastern District of the Scottish Junior Gas Association on so memorable an occasion as the celebration of the semi-Jubilee of its life and work. This meeting revived a host of pleasant memories; and he supposed the fact that he was the oldest surviving Past-President was the qualification he possessed in respect of the privilege he had of addressing them.

On May 7, 1904, the Western District Association was fully constituted; and among the names of the first Council were those of Mr. J. Lowe, now Gas Engineer at Auckland, New Zealand, and Mr. John Barker, now Gas Engineer at Nairn, as President and Vice-President respectively. The Secretary was Mr. W. M. Mason, now Manager of the British Commercial Gas Association, while the Council contained such well-known names to-day as Mr. J. W. McLusky, Chief Engineer and Manager of the Glasgow Gas Department; Mr. Charles Fairweather, Gas Engineer, Kilmarnock; Mr. James Bell, Gas Engineer, Dumbarton; and Mr. D. S. Munn, Gas Engineer, Renfrew.

On May 28, 1904, the following members were elected as the first Council of the Eastern District: President, Mr. Alexander Masterton, of Edinburgh; Vice-President, Mr. James Dickson, of Dunfermline; Hon. Secretary and Treasurer, Mr. Henry Rule, of Falkirk; Messrs. J. T. A. Taylor (Granton), W. Blair (J. Milne & Son, Ltd.), H. H. Gracie (Granton), W. Brown (Lasswade), Thomas O'Neil (Dunbar), and W. Young (Penicuik).

Of these, Mr. Masterton succeeded Mr. Herring as Chief Engineer and Manager of the Edinburgh Gas Department. His enthusiasm and influence were valuable factors in the success of the early days of the Association. He was now dead, but had left behind, in the records of the Junior and the North British Associations, pleasant recollections of one endowed with ripe experience enriched by an unfailing courtesy and charm of personality.

Mr. Dickson said he took the opportunity of saying how pleased they were to find Mr. Gracie, also one of the first Members of Council, now occupying, with so great a measure of success, the responsible position of Chief Engineer and Manager to the Edinburgh Gas Department.

Great changes in works equipment and in methods of manufacture and distribution had taken place since the formation of the Association, and the personnel of the industry had advanced in conformity therewith, due in no small degree to the technical qualifications which the Junior Associations had contributed to the common fund of knowledge. Despite keener competition from every direction, the junior of to-day would prove himself capable of carrying forward the torch with even greater zeal and efficiency than those who had gone before.

WORK OF THE JUNIORS.

The work undertaken by the Junior Associations was a complete and sufficient answer to any despondency with regard to the future outlook. Composed as they were of men deeply interested in their work, and equipped with a high standard of technical training, their success was writ large in the annals of the industry. They had taken a praiseworthy share in the evolution of the Education Scheme of the Institution of Gas Engineers, and had helped to strengthen the claims of that body for the grant of a Royal Charter.

He would not let this opportunity pass without paying tribute to the debt which the Junior Associations owed to the eminent and distinguished work undertaken for so long by Prof. Arthur Smithells, and now by Prof. J. W. Cobb, at Leeds University. The scientific and industrial research thereby brought to bear upon problems of the carbonization of coal and the utilization of gas had been of inestimable educative value to the Associations, while the effect upon the industry had been remarkable in its trend towards the improvement of processes, methods, and plant. The work of Leeds University, viewed either in the light of research accomplished within its walls or in the number of young men which it had sent out into the world of gas engineering, had contributed in very large degree to the vast increase of the powers of the industry as a great utility service.

EDUCATION.

There was a tendency to-day towards educational qualifications broadening out to a graduate course in science and engineering, with the student entering into the practical aspects of the work of the industry at a later stage in life than hitherto. To most of them, works experience allied to evening class work following upon a sound secondary education had necessarily been the course through which they had evolved from the apprenticeship stage to more responsible positions in the industry; and this must largely continue to be so. They measured the success of their enterprises, both educational and commercial, by the actual results achieved; and there was evidence on all sides that those Scottish qualities of "grit, smeddum, and gumption" were as requisite as ever in the make up of the individual in order to fit him for the battle of life. Their task must ever lie in perfecting their knowledge by every means at their command; and it was surely among the least of the duties of the senior, engaged largely in administrative matters, and perforce obliged to delegate to the junior technical problems requiring concentration of thought, that he should assist in fostering the enlargement of opportunity for youth to become well grounded in first principles.

VALUE OF THE TECHNICAL PRESS.

The importance of the Technical Press as an educative factor hardly required emphasis at a meeting of Juniors, but it was necessary that reference should be made to the valuable help which the Press of the industry had given to the Associations, through the medium of reports on engineering, chemical, and commercial matters. No Junior who was desirous of being fully equipped could afford to neglect the pages of current literature prepared with such careful attention to detail, and maintaining so high a standard of excellence. As an industry, they were specially fortunate in this respect. The Technical Press was a mine of information which the Junior Associations would do well to continue to draw from in their endeavours to keep abreast of progress in these fast-moving times.

CHANGED CONDITIONS.

Mr. GAVIN, in replying to the toast, said that the story of the birth of the Association, which they had just heard from Mr. Dickson, was a wonderful one. The Association was cradled in adversity; and to that fact, he thought, it owed its vigorous life to-day. There was evidence that about the year 1904 the Senior Associations looked on the infant with a certain amount of distrust. How different, he said, did they find circumstances to-day, when the Juniors owed so much to the kindly interest of the Seniors in matters which lead to the advancement of the student's knowledge.

OTHER TOASTS.

Mr. R. L. LAING (Brechin) proposed the toast of the "Honorary Members," to which Mr. NAPIER replied.

Mr. D. VASS (Perth) submitted "Past-Presidents and Officers;" the response being made by Mr. JOHN R. MOYES.

Mr. E. L. FARQUHAR (Kennoway) proposed "Kindred Associations," and Mr. JOHN MURRAY (Glasgow) replied.

THE COLEMAN OXIDE DISINTEGRATOR.

A Cheap, Efficient, and Flexible Unit.

The Coleman Foundry Equipment Company, Ltd., of 1, Lancaster Place, Strand, W.C. 2, are manufacturing and marketing a highly efficient oxide disintegrator of ingenious design and having unusual flexibility. The machine is a self-contained unit which can be handled and brought into position by one man; the current consumption per unit of oxide treated is commendably low; and both initial cost and upkeep expenses are remarkably small.

The Coleman oxide disintegrator has as its basic feature an impeller head with revolving impellers. The motor and disintegrator form one compact integral unit, direct-connected, and obviate all gears and belts, with their resultant power losses

The Coleman Oxide Disintegrator.

and complications. Moreover, the combination of impeller, centrifugal, and blast action of the disintegrator enables the machine to throw or project oxide upwards as high as 25 ft. or more. This feature is an important one, for the machine acts not only as an oxide breaker—and all gas engineers are aware of the important part which surface area plays in the sulphuretted hydrogen absorption process—but as an oxide distributor. For revivification purposes, this is obviously a desideratum.

The Coleman machine, which is illustrated here (the photograph, by the way, was taken on a gas-works), is substantial in construction, and is built for rapid and efficient operation. The wheels are fitted with roller bearings, to permit of easy handling, the propeller shaft revolves in ball bearings with dust-proof mounting, the impeller blades can be quickly and easily changed, and the moisture content of the oxide has no effect on the efficiency of the machine as a disintegrating unit. Altogether, the Coleman oxide disintegrator is a piece of plant worthy of the attention of gas engineers generally.

FAIRWEATHER RECORDING CALORIMETER.

Scientific and Projections, Ltd., have published an extremely interesting booklet on the Fairweather total heat recording calorimeter, of which they are the sole licencees and manufacturers. The instrument was first brought before the gas industry in 1921, and is now installed in many important gas undertakings. Its use has led to new methods of works control. Owing to its reliability, speedy response (time lag only 1½ minutes), and high degree of sensitivity, changes in C.V. are accurately recorded almost immediately; and the record itself admits of detailed analysis, enabling plant to be tuned up to maximum efficiency. Apart from the larger undertakings, the Fairweather instrument should appeal also to those of more modest dimensions. Though it is necessary to meet statutory obligations by ensuring that calorific value is up to the declared standard, it is to be remembered that excess of B.Th.U. above the normal means so much lost revenue. By using the Fairweather instrument, it is possible to run plant so as to keep the quality within narrow limits; thus meeting statutory obligations on the one hand, and ensuring a maximum of revenue on the other.

The Fairweather instrument is one that makes an appeal to gas chemists, since it operates on lines following closely those of the standard test for calorific value. It includes what is practically a standard test set (Boys calorimeter, meter, &c.), so arranged that, without any additional verification apparatus, a Standard Referees' Test can be readily made at any time to check the recorded C.V. without interrupting the record. Moreover, each functioning part of the instrument may be readily checked and, if necessary, adjusted. Finally, the instrument requires but little attention.

The handbook is divided ino two parts. Part I. gives a concise description of the complete instrument, and Part II. contains instructions for running the instrument. These instructions are based upon experience, and are recommended as combining a maximum of efficiency with a minimum of attention. To render the instructions clear and precise, certain matters are dealt with in detail by a number of appendixes.

CORRESPONDENCE.

[We are not responsible for opinions expressed by Correspondents.]

Technical Progress in Tar Distillation.

SIR,—Your issue of Jan. 2 contains an excellent article by Mr. W. G. Adam which has proved particularly interesting to me. The article is rather misleading, however, as regards technical progress made in methods of tar distillation.

Mr. Adam summarizes the progress made in France, Germany, and America; but I differ from his view that the outstanding feature of the year is the "direct" system of distillation developed by the Barrett Company, in America.

During the past two years I have perfected and patented a process, which may be either continuous or intermittent, for the "direct" recovery of refined or Road Board tar by fractional condensation from crude coal gases. The process is now thoroughly established, and has been in continuous and perfectly satisfactory operation, under licence, at a coke oven plant carbonizing 360 to 400 tons of Yorkshire slack per day. Crude tar is, consequently, a thing of the past at this works; the entire output having been sold under guarantees, and at favourable prices, for a considerable period ahead.

The process is remarkably simple, flexible, and economical, while further developments on fundamental scientific principles are highly probable. The main advantageous features of the process are as follows:

1. No labour is required beyond that for producing crude tar.
2. No distillation plant is required.
3. Capital charges are extremely low—practically negligible.
4. The process requires only steam, and this in small amounts.
5. Fire risks absolutely abolished.
6. Process is quite flexible as regards viscosity of tar produced.
7. Creosote, naphthalene, and naphthas of excellect quality obtained as secondary products.
8. Sufficient creosote produced to satisfy benzole recovery requirements.
9. The tar fulfils, and is superior to, the specification of the British Road Tar Association.
10. The tar is completely free from ammonia or its salts.
11. Very considerable quantities of crude tar may be purchased from outside sources, and converted into refined tar at an exceedingly low cost.
12. The tar is perfectly constant in quality.

I believe Mr. Adam is aware of the process, which is obviously more remunerative than any tar distilling unit can hope to be at the present time.

Negotiations with interested parties preclude me from giving as much detail as I would like, but at a more favourable opportunity I hope to publish all possible data.

In the meantime, I hope I have provided you with some evidence of progress in this country. In conclusion, I heartily endorse the remarks of Mr. Adam regarding the imperative necessity of sustained and combined effort in developing the road tar market.

F. COOKE.

The Wombwell Coke and Bye-Product Company, Ltd.,
Wombwell Main,
Near Barnsley,
Jan. 5, 1929.

Mr. Gilbert's Lecture to the London Juniors.

SIR,—In reply to Mr. West's letter in your "JOURNAL" for Jan. 2, I should like to say that I have not the slightest intention of depreciating the high value of Mr. Gilbert's remarks. Indeed, I had already written to congratulate him on his excellent address.

The word "advise" in my letter, which was published in the "JOURNAL" for Dec. 26, was an error on my part. It should have been "inform." Thus the amended reading is: "May I inform Mr. Gilbert that the firm of George Wilson Gas Meters, Ltd., made and supplied these specified appliances as far back as ten and twenty years ago."

J. H. WILSON.

George Wilson Gas Meters, Ltd.,
Coventry,
Jan. 7, 1929.

MISCELLANEOUS NEWS.

THE BLOOMSBURY EXPLOSION INQUIRY.

Tuesday, Jan. 1.

The Commissioners appointed by the Home Secretary to inquire into the circumstances of the explosions which occurred in the Bloomsbury district of London on Dec. 20 resumed their inquiry on Tuesday, Jan. 1, at the County Hall, Westminster. (The evidence given on the first day of the hearing was published in the "JOURNAL" for Jan. 2, p. 50, *et seq.*) The Commissioners are Mr. R. G. Hetherington, O.B.E., M.Inst.C.E., Deputy Chief Engineering Inspector under the Ministry of Health; Lieut.-Col. R. A. Thomas, C.B.E., one of His Majesty's Inspectors of Explosives, and a Member of the Explosives in Mines Research Committee; and Mr. E. H. Tabor, M.Inst.C.E., Assistant Chief Engineer of the London County Council.

Mr. *Robert Sinclair* (Chief Inspector of the Centre External Section of the Post Office Engineering Department, who is responsible, under the Section Engineer, for construction work in the tunnel and for its maintenance) gave evidence as to the construction and use of the Post Office tunnel in which the explosion took place. His evidence in some respects differed from that of Mr. Fisher, another Post Office employee. The tunnel, he said, was normally dry, and did not contain organic material which might be expected to give off deleterious gases. It was not air-tight. In one of the manholes further west there was normally a certain amount of water, which percolated into it from some source, and it had been found impossible to keep it out. The plant in the tunnel was Post Office telephone plant, there being 20 separate telephone cables carried along the greater part of the length in the affected area. The cables were of copper wire, with paper insulation, made up in pairs, and the whole was enclosed in lead sheathing. The other plant in the tunnel was galvanized steel tubing, containing electric light and power cables. This tubing continued along part of the tunnel. There were 5-ampere water-tight cast-iron switches, fitted with 5-ampere sockets, with a third pole for earthing. The switches and sockets, said witness, were used for lighting the tunnel and for working the fan of a blowing machine used for ventilating the tunnel. The blower was in use frequently. It was necessary for the Post Office workers to traverse the length of the tunnel from time to time, and in the safety book which was issued to them the following instructions were contained:

> If you know of or suspect the presence of gas in a box or manhole, do not use a naked light. Arrange to open adjacent boxes also, each being guarded, especially against the dropping of lighted matches.
>
> Advise engineer. Test air with safety lamp before entering manhole. If light will not burn, do not enter until air clear. See that door and glass of lamp are intact.

The purpose of removing the manhole covers, it was pointed out, was to remove the gas and foul air that might be present. One method of ventilating a tunnel was to remove all the covers and allow the gas and foul air to disperse, but a quicker and more effective method was to use a blower. That was the reason why Fisher, Standley, and Thrower had removed the manhole at High Holborn on the morning of the explosion. At the time of the explosion a manhole further along the tunnel had also been removed, in order to allow air to be blown through it. Even if the men had tested the air by means of a safety lamp, and the flame had indicated the presence of foul air, it would still have been necessary for someone to descend into the tunnel to turn on the switch to operate the blower, so that the action taken by Thrower (the employee who had since died) was the right action.

There were ducts leading from the tunnel to the L.C.C. subways at Kingsway and Charing Cross Road; and these were kept blocked with cork bungs and sealed with a compound.

The CHAIRMAN asked if the compound set hard or remained plastic.

Witness replied that it set hard. There were other ducts and pipes, he said, which ran from the tunnel into the manhole chambers along its length, and these were not blocked.

Questioned by Mr. A. T. MILLER, K.C. (for the Gas Light and Coke Company), witness said that the manhole of the chamber in High Holborn, where the accident had occurred, was at the eastern end of the chamber. The distance from the road surface to the top of the tunnel was 5 ft. 3 in., and the height of the tunnel was 4 ft. The entrance to the tunnel on the eastern side of the chamber was immediately below the manhole frame, and the switch was situated about 4½ or 5 ft. from that point, along the tunnel.

Mr. MILLER suggested that it would be dark in the tunnel at 8 o'clock on the morning of Dec. 20, and the man who had to fit the plug into the sockets would be standing between it and whatever light there was, so that it would be difficult for him to see.

Witness replied that it would not be very dark; and in his view the man could see the switch.

POSSIBILITY OF ELECTRIC SPARK.

Mr. MILLER suggested that the man would need some sort of artificial light. He suggested also that if the switch in the tunnel were turned on, and if the switch on the motor also were turned on, before the plug was fitted into the sockets, an electric spark might occur at the moment of connection of the plug and the sockets.

Witness replied that this was not so, because this type of plug had to be screwed into position, and when it was screwed in it was air-tight.

Mr. MILLER asked if it were suggested that a man could unscrew the socket cover, connect the plug to the sockets, and switch on the current by sense of touch.

Witness said it could be done entirely by sense of touch by a man who was used to it.

[At this point the Chairman fitted the plug into the sockets, and screwed it in, in order to test the matter for himself. He said he could not see why contact was not established when the plug was first inserted into the sockets before it was screwed up tight, and that he would ask some questions with regard to this at a later stage.]

Mr. MILLER said that if the switch in the tunnel, and the switch on the blower, were on before the plug was inserted into the sockets, a spark might be made at the moment contact was established.

The ATTORNEY-GENERAL (for the Postmaster-General) pointed out that it was mechanically impossible for the switch on the blower to be turned on at that stage.

Mr. MILLER said he was not aware of that. Assuming his hypothesis to be correct, however, he could imagine that a spark might result.

Witness replied that he had never seen a spark across a plug of the type used.

Mr. MILLER then pointed out that there were three prongs on the plug, one of which was larger than the others, so that the man inserting it would have to fit the larger prong into the larger socket, and the smaller ones into the smaller sockets, and he would need a very sensitive touch or a considerable amount of light to be able to insert it.

Witness replied that it was easy to a man familiar with it.

In reply to further questions, he said the current was direct, at 200 volts.

Mr. MILLER, continuing, said there might be gases in the tunnel which were not poisonous but which were explosive, and they might be exploded by a spark caused by contact of the nails in a man's boots with an iron ladder, or in other ways. On the other hand, the gases might be poisonous, and a man might be overcome by them. He gathered that the regulations were designed to ensure that precautions were taken against these risks.

REGULATIONS TO PREVENT RISKS.

Witness said it was known that there was gas in the tunnel, and the men had gone there to disperse it.

Mr. MILLER observed that the precautions to be taken involved sending a man down into the tunnel containing the gas.

Witness agreed.

Mr. MILLER asked if that were wise.

Witness said it was, and that the man would be able to disperse the gas.

Mr. MILLER: He seems to have dispersed it over a very wide area.

The ATTORNEY-GENERAL: I hope you are not assuming that he did disperse it.

Mr. MILLER said the regulations were designed to prevent men going into the tunnel until the gas was cleared, and he suggested that if Thrower had tested the air with a safety lamp he would probably not have entered the tunnel.

Witness said he did not know.

Mr. MILLER then asked questions to ascertain what precautions were taken to ventilate the tunnel even before a man descended for the purpose of connecting the blower to the electricity supply; and he asked if instructions had been issued to the effect that when gas was suspected, manhole covers should be removed along the tunne. in each direction from the chamber at which the blower was to be used.

Witness replied that in order to clear the section of the tunnel from the chamber in High Holborn in an easterly direction, the manhole cover at the eastern end of that section would be removed as well as the cover in the chamber at High Holborn, in order to blow the gas through. It had been the practice to open three manhole covers before the use of blowers had been adopted, but not since.

Mr. MILLER then suggested that, in order to render it unnecessary for a man to descend into the tunnel to switch on the blower, the switch should be installed not in the tunnel itself, but in a more accessible place—*i.e.*, on the wall of the shaft immediately below the manhole cover, so that when the cover was removed it would be necessary for a man merely to insert the plug and switch the current on without himself leaving the ground surface.

Witness agreed that it would be possible to instal the switch on the wall of the shaft within reach from the ground surface.

Questions were then asked by Mr. Miller as to why joints in the tunnel had been sealed, and witness replied that they were sealed from the inside with cement, in order to ensure that the tunnel was water-tight. He agreed that it was of very great importance that tunnels should be properly ventilated. He would have thought that the tunnel was ventilated by the ducts leaving the tunnel in various places, and which were not sealed.

THE QUESTION OF VENTILATION.

There was a long cross-examination on the point whether the Post Office tube is sufficiently ventilated; witness insisting that it is.

Asked for details, he said that with the exception of the ducts that entered any of the L.C.C. subways—which were plugged in accordance

with the desire of the L.C.C. engineers—none of the ducts leading away from the tube was plugged, and the space between the cables and the ducts permitted of ventilation. The unused ducts were not plugged. The cables running through these ducts went to telephone boxes in the pavement, and the lids of these boxes were a loose fit. It was admitted that the reason why the ducts entering the L.C.C. pipe subways had to be completely plugged if they were not occupied by cables, or the ends of the ducts round cables had to be filled in with a compound, was to prevent the foul air from the tube entering the L.C.C. pipe subways. There were three such L.C.C. subways into which ducts from the tube ran.

Mr. MILLER pointed out that the main manholes of the tube were very securely caulked, as also were the keyholes of the manholes.

Witness said the caulking consisted merely of laying a piece of yarn round the edge of the manhole, and filling in with a compound.

Mr. MILLER: Your evidence, given seriously as an official holding an important position with the Post Office, is that these methods, or lack of methods, afford adequate ventilation to prevent the danger which an ill-ventilated space in London undoubtedly presents?

The ATTORNEY-GENERAL said this was a question which this witness could not be expected to answer without a better definition as to what was meant by "adequate ventilation." The witness could not be expected to answer a question which implied legal responsibility or liability.

The CHAIRMAN suggested that the question might take the form of asking witness whether he thought the ventilation afforded was sufficient to allow the free passage of foul air out of the tube, or something of that kind.

Mr. MILLER then asked witness whether he thought the small orifices to which he had referred in the ducts were sufficient to carry out of the tube any accumulation of sewer or other gas that might have got in.

Witness, who took a long time considering his answer, finally said it all depended on the amount of foul air in the tube.

In answer to a further question, he said that the foul air from the tube entering the L.C.C. subways had been a matter of discussion with the L.C.C.; but there had been no difficulty over it.

The ATTORNEY-GENERAL, intervening, said he was entirely in the dark as to the purport of these questions.

Mr. MILLER then closed his cross-examination with a request that Mr. Sinclair should be recalled if necessary later.

The ATTORNEY-GENERAL said it was highly probable that Mr. Sinclair would have to be recalled in any case; and he would be present throughout the whole of the inquiry.

Mr. LIONEL WALFORD (Town Clerk, Holborn) put a number of questions with regard to possibilities of sparking from the plug from the blower and the switch in the tube; but the position with regard to this was made clear by a subsequent witness who was called to deal with this matter.

POSSIBILITY OF A SHORT CIRCUIT.

The questions related to the possibility of the flexible lead from the machine being left out in the rain—it was wet on the day of the explosion—and a short circuit developing, giving rise to a spark which would ignite any explosive mixture that might have been in the tunnel. Mr. Walford added that he had seen these flexible leads for use with such blowers left on the pavement in the rain.

However, no satisfactory answer could be given by Mr. Sinclair on this point beyond an expression of opinion that he did not think a short circuit could arise even in these circumstances, owing to precautions taken at the machine.

Mr. WALFORD also suggested the possibility of the relatively thin lead covering of the telephone cables becoming abraded on the hangers holding them, due to vibration from traffic above, and causing a short circuit and a spark.

The CHAIRMAN reminded Mr. Walford that these were telephone cables, not power cables.

Mr. *Sinclair* agreed that there was the possibility of a short circuit on the cables giving the lighting and power supply, though it was unlikely, as they were carried in a steel tube; but he saw no possibility of any danger from a short circuit on any of the telephone cables. Indeed, he could not admit that there was any possibility of a short circuit occurring.

Mr. WALFORD then put questions as to whether any investigations had been made by the Post Office authorities since the explosion to ascertain what particular type of gas did in fact explode.

Witness said that he was not aware of any. Nor was he aware whether any tests had been made, chemically or otherwise, on any deposit on Thrower's clothes, to ascertain what type of gas had exploded.

Answering further questions, witness said that he had made a report upon what happened in the tube in November, 1926.

Mr. WALFORD promptly asked for it.

The ATTORNEY-GENERAL said that there had been scores of reports and minutes relating to this tube since 1921; and if they were all to be produced, they would take a very long time in preparation.

Mr. MILLER expressed the opinion that they all ought to be made available from the time the Post Office took over the tube.

The ATTORNEY-GENERAL observed that he had no objection to producing any special report, such as the one now asked for by Mr. Walford, but he was a little reluctant to bring forward every minute and report since 1921, because not only would it mean an enormous amount of work, but there would be a mass of material which would be of no value whatever so far as the inquiry was concerned.

Eventually, it was agreed that the solicitors on either side should run through the documents, and decide upon those which should be handed in.

The ATTORNEY-GENERAL added that the Gas Light and Coke Company ought, on their part, to produce all relevant documents concerning the leakages of gas and repairs to mains in this neighbourhood during a period of (say) six months before the explosion.

Mr. MILLER said that this information would be available almost immediately. Continuing, he remarked that he regarded the question of the ventilation of the tube as a most relevant matter to this inquiry, and, moreover, he had not asked his questions with regard to ventilation on the assumption that the gas that exploded was coal gas. On the contrary, he was very far from satisfied on this point, while his experts who were still investigating the matter were swaying farther away from that possibility. The ventilation was of importance whatever gas caused the calamity.

Mr. WALFORD continued his questions to Mr. Sinclair, and was told that there was always some gas in the tube. Though witness could not account for it, he agreed with Fisher that the nasty smell in the tube was worse in wet weather than in dry weather.

Witness further said he had made a complaint on one occasion in 1926 to the Holborn Borough Council of a smell of sewer gas in the tube, and had asked for an investigation to be made. This was a personal request, and he had later been informed that the matter had been rectified.

Mr. TREVOR WATSON (for the L.C.C.) put it to witness that, as the regulations regarding tests for foul air or gas had been in existence long before the blower was employed, it could hardly be said that the safety lamp test, as defined in the rules, applied to the conditions as they now existed. In other words, when the regulations were framed, there was no question of going down a manhole to start up a blower.

Witness agreed and, in reply to another question, said he had had no report of foul air in the tube round about the date of the explosion.

The CHAIRMAN, referring to the answer by Mr. Sinclair that there was always some gas in the tube, asked if coal gas was suspected.

Witness said that subsequent to 1926 he had suspected coal gas. Before then there had been no smell of coal gas.

The CHAIRMAN asked whether any definite decision had been come to as to the nature of the gas poisoning of Fisher and Levett in November, 1926.

Witness replied that the medical reports at the time referred to gas poisoning.

The CHAIRMAN: But you are rather thinking it was coal gas?

Witness: I am afraid I cannot answer that.

DEFECTIVE PLUG.

The CHAIRMAN then held up a new flex and plug, together with the flex and plug actually on the blower at the time of the explosion, and he pointed out that, whereas on the new flex and plug there was a set-screw which prevented the pins going far into the sockets until the outer ring was screwed up, in the case of the one on the machine this set-screw was missing, and allowed the pins to go much farther into the sockets before screwing-up took place. To this extent, the one in use was defective.

Witness agreed that this was so.

The CHAIRMAN: Supposing the manhole had been tested, and gas found in large quantities, was there any means of starting the blower other than going down into the chamber?

Witness: No.

The CHAIRMAN: But I take it that you have a self-contained blower?

Witness: Not that I am aware of, in this section.

Mr. *James Brown*, Assistant Superintending Engineer, London District, G.P.O., and in charge of external construction in London, said that he was sectional engineer for this district when the tube was acquired by the Post Office. After explaining how parts of the subway were at the moment blocked and inaccessible, he told how the manhole at the Western Central Post Office, where Thrower was injured, had been cleared, and had been inspected by himself and others after the explosion. The switch to which connection with the blower would have been made was 3 ft. 10 in. inside the tube; and he maintained that in the ordinary way there was sufficient light in the tunnel to see to make the connection. He found the cap screwed tightly on the socket for the plug, and the switch was in the "off" position, suggesting that Thrower had not been able to make the connection.

TESTS IN NOVEMBER, 1926.

Mr. MILLER cross-examined, and referred to the November, 1926, incident and to a letter from Mr. Brown to the Gas Light and Coke Company, informing them of what had taken place. He described how by arrangement the tube was closed down for a few days, and tests made of the air, with the result that a letter was sent to Mr. Brown stating that the representative of the Post Office who had assisted in taking the tests of the air was satisfied that the smell complained of was not coal gas. The Post Office had not replied to that letter; and it was therefore to be assumed they were satisfied.

Witness: I do not think the Department was satisfied.

Mr. MILLER: Why?

Witness said that the gassing of the two men in November, 1926, had never been accounted for. Though the gas leak indicator did not show the presence of coal gas, he himself had smelt faint traces of coal gas; and he believed the analyses that were carried out ultimately proved that there was "an odour of gas."

Mr. MILLER said that he supposed the tests were made with a gas indicator of the usual type.

Witness observed that the reading depended upon the diffusion of the gases, and the recording mechanism recorded both the light and the heavy gases. He admitted that the result when he used such a gas indicator after the 1926 occurrence was negative so far as coal gas was concerned; nevertheless he did detect personally a faint smell of coal gas in the tube. The indicator needle on the instrument would not record less than 1 p.ct.

Mr. MILLER: Not being satisfied, did you do anything more?

Witness said that he took samples of the air in the tube in December, 1926. Three samples were taken from three different manholes, and the bottles containing the samples were sent to the analyst's department of the Post Office.

Mr. MILLER asked to see the analyses.

The ATTORNEY-GENERAL objected on the ground that he himself had not yet had an opportunity of being instructed as to the value

of these analyses, and he did not wish the witness to be cross-examined on points which he himself did not yet understand.

Mr. MILLER (to witness): You did not think it desirable to communicate the results of those analyses to the Gas Company?—No.

[Subsequently both Mr. Miller and Mr. Trevor Watson were allowed to look at the analyses on the understanding that they made no public reference to them.]

In answer to further questions,

Witness said that the blower was introduced as an additional precaution for the safety of the men. He was consulted as to the method of working the blower which had been described, and considered it a reasonable thing to do.

Mr. MILLER: The blower was to remove foul gases?

Witness: I cannot agree. It was to remove foul air. If there had been any suspicion of gas, we should have stopped work. Witness added that he had issued special instructions after the 1926 incident that the men were to take no chances in the tube.

Mr. MILLER asked for these written special instructions, and was handed a copy by the Attorney-General. These instructions were dated Nov. 26, 1926, and impressed upon the men that they were to take no chances—that under no conditions must work be started in any manhole or subway until the air had been proved fit to breathe, and that while at work a safety lamp should be kept near the floor. It was also laid down that the lamp should be watched, and should it glow dim the men must come up to the open until the foul air had been removed.

A series of questions was then put as to the justification for the men, in face of these instructions, entering a manhole or subway without testing with a safety lamp.

Witness said he should regard it as perfectly safe if there was no smell of gas when the manhole cover was taken off.

Mr. MILLER suggested that there might be a layer of heavy gas at the bottom which would not be detected by smell from the ground level, and that a man entering, as Thrower had done, would plunge himself into a poisonous gas.

Witness said that, if there was any smell of coal gas, the men did not go into a manhole.

The CHAIRMAN: Do you mean that if your men had detected coal gas on this occasion they should not have gone down? There is a conflict of evidence between the two witnesses who actually opened the manhole. One clearly stated he detected coal gas, and the other said he did not. What is your view as to what ought to have been done if, in fact, they detected coal gas?

Witness said that coal gas was detected at times in the Post Office manholes, and the Gas Company were advised. There was the closest co-operation between the Gas Company and the Post Office, and steps were always taken to put the matter right immediately.

The CHAIRMAN: I am impressed with the fact that on Dec. 20 the men had neither safety lamps nor electric torches.

Witness said the men's instructions were to connect the blower and get it working before anybody worked in the manhole or tube.

The CHAIRMAN remarked that it was nevertheless necessary for someone to go down into the manhole to connect the blower; and yet the men did not have the means for detecting the presence of gas.

In the course of a consultation between the Commissioners and the parties at the close of Mr. Brown's evidence, the question of permanently repairing the damage that has been done to gas, water, and other mains, sewers, &c., was mentioned; the position being that everybody held their hand pending the inquiry. It was agreed, however, that steps should at once be taken to do what is necessary to restore the facilities to this district.

THE VALUE OF A SUBWAY.

Mr. WALFORD hinted that something in the nature of a subway might be constructed.

Mr. MILLER said that this had been discussed to some extent by the Gas Company; and the view was held that a subway did not always do what the supporters of the method anticipated. The present was a striking case. The Gas Company's view was that the safest and best method, and the most convenient way, of dealing with underground pipes and cables was to lay them in the ground.

The final witness on Tuesday, Jan. 1, was Mr. *Herbert Cornish,* Assistant Superintending Engineer in charge of the electrical plant, G.P.O. He said that there was a spring in the starting switch of the blower which kept it in the "off" position until the current was switched on in the tube. Thus there could be no possibility of a spark having been caused when plugging-in in the tube.

Wednesday, Jan. 2.

Thomas Levett, a skilled workman, Class II., employed by the Post Office, speaking of the incident in November, 1926, when he and Fisher suffered from foul air in the tube, observed that up to that time he had never noticed anything wrong. On that occasion they had proceeded about 150 yards in the tube towards Shaftesbury Avenue when he noticed a difficulty in breathing, and suggested to Fisher that it might be due to the foggy weather outside. It was while they were coming back, having completed the work they went to do, that they were overcome; and since that time the blower had always been used before any work was done in the tube. On the day of the explosion he arrived at the manhole just as Thrower was receiving first aid.

Questioned as to his practice when he was in charge, Levett said he opened the manhole and left it for a period, even as long as half-an-hour, before going down to connect up the blower. His only method of deciding whether it was safe to go down was by "sniffing." He never allowed one of his gang to go down until he himself had been down. From Oct. 30 until Dec. 3 the tube was in use day and night for the purpose of laying new cables, and the blower was in continual operation all that time.

Mr. MILLER questioned witness at some length, and ascertained that only on two previous occasions had Thrower been into the tube for connecting the blower.

Asked to describe his sensations on the occasion of being overcome in November, 1926, witness said there was first a great difficulty in breathing, then he began to lose the use of his legs, and afterwards the use of his arms. There was also severe headache, and some smarting of the eyes, which at first he had put down to the foggy atmosphere.

Witness told Counsel that the Post Office workmen and the Gas Company's workmen often chatted together; but he did not remember saying to any of them that there was sometimes difficulty in clearing out the tube even with the blower, or that he thought there was sewer gas there.

COUNSEL: The Gas Company's workmen have the idea that your impression was that the blower cleared out the top of the tube better than the bottom.

Witness replied that he did not remember saying anything of this kind, and he did not think it was the case. He added, in answer to a further question, that, if he had thought there was an escape of coal gas, he would have notified the Gas Company, and also reported to his Inspector.

In answer to Mr. WALFORD'S questions, witness persisted in his statement that the state of the atmosphere in the tube became bad round about November, 1926, and that he could not account for it.

The CHAIRMAN questioned witness as to the suggestion that he had mentioned sewer gas when speaking to other workmen, and asked if the term had been used in a general way as indicating a nasty smell, similar to that which would be noticeable if a sewer cover was taken off.

Witness agreed that this was the only way in which he would have used the expression.

The CHAIRMAN: You have never traced any symptoms of coal gas?—I could not say.

You would not have put it down to coal gas if you had been asked?—I do not think I should.

The ATTORNEY-GENERAL intimated that this was all the evidence he was able to tender for the present.

EVIDENCE FOR THE GAS COMPANY.

Mr. MILLER then presented some evidence on general lines on behalf of the Gas Light and Coke Company.

Mr. *Stephen Lacey,* B.Sc., A.M.Inst.C.E., said he had been in the service of the Gas Light and Coke Company for the past seventeen years, during the first seven years of which he acted as Assistant Distributing Engineer, while during the past ten years he had held the position of Distributing Engineer to the Company. Previously, for five years, he had been with a firm of consulting engineers engaged in the design and construction of water pipe lines and similar work.

Witness mentioned that the Gas Light and Coke Company serves an area of 265 square miles, in which are laid 4000 miles of mains. There are 1,100,000 consumers and 500,000 service pipes. He explained how the system is divided into high-pressure and low-pressure mains with branches to distributing centres; there being both high and low pressure trunk mains fed from thirteen gas manufacturing centres. The high-pressure system in the central London area worked at 27 in. water gauge. There were 110 miles of these high-pressure mains, the largest being 48 in. in diameter, and the smallest 12 in. in diameter; but no gas was supplied direct from these mains to consumers. One of the 48 in. mains passed through part of the district involved in the explosion. The low-pressure trunk mains worked at a pressure of about 5 in. water gauge, and varied from 18 in. in diameter upwards to as much as 48 in. In addition to these high and low pressure trunk mains, low-pressure feeder mains were laid in the carriage-ways, from which smaller mains were fed on either side of the road to supply the consumers' services. In the area of the explosion there was a 24-in. low-pressure trunk main running through from Princes Theatre westwards, and, of course, a network of other mains for supply to consumers. The high-pressure and low-pressure trunk mains and the feeder mains were of cast-iron with socket and spigot joints which were finished off with lead and yarn; this being the normal practice in the gas industry in this country and throughout the world. The 48-in. high-pressure main in the area of the explosion was laid in 1883, the 24-in. low-pressure main in High Street was laid in 1879, and an 8-in. main also running through High Street was laid in the same year. There was a 6-in. high-pressure steel main running through New Oxford Street and High Holborn which was laid in 1914 solely for the supply of the public lighting system in Holborn and Westminster. The service pipes were of wrought iron, and in normal circumstances were coated with bitumen paint; but where the soil was thought to be corrosive, a special protection was given.

Having explained how the central control house at Horseferry Road is in connection with the various manufacturing centres, Mr. Lacey said that the total area of the Company is divided into five parts, each in charge of a divisional mains superintendent who was responsible—under himself—for the laying and maintenance of pipes in his individual area up to a size of 12 in. The larger mains were laid by the Company's mains contractors under the supervision of his own Chief Assistant, who had a special staff of qualified inspectors. There were 900 men employed on mains service and distribution work, while the Sales Department, which worked in close co-operation with the Distribution Department, had 3500 gasfitters.

Some details were then given of the organization for dealing with gas escapes; this work being given precedence over all other work. The Company has special arrangements by which men and material can be brought together at the shortest possible notice during working hours; information being kept in the office of the positions in which the men are at work, so that they can be called together promptly to deal with an escape. Much the same arrangements hold with regard to the contractors' men during working hours. After working hours, a number of men are paid a retaining fee to remain at their homes, so that they may be sent for if required; a night watch-

man being available at the various offices to deal with emergency messages.

DETECTION OF GAS LEAKAGES.

Dealing with the character of the problems associated with the location and detection of gas leakages, Mr. Lacey said that, contrary to the opinion often expressed, modern road construction conditions and the larger amount of traffic on the roads to-day did not make the task of detecting gas leakages more difficult. In the days when the roads were principally of macadam, escapes of gas found their way through the surface of the roads into the atmosphere, and often remained undetected for considerable periods. Under modern conditions of road construction, however, the surfaces of the roads were more or less gas-tight; but as a set-off to this was the fact that there were now a considerable number of ducts laid in the vicinity of gas pipes leading to small pavement manholes and inspection boxes. There were, in addition, boxes covering the spindles of water valves, and a large number of boxes for covering the stand-pipes on the receivers along the Company's mains; and gas leaking from a main would take the line of least resistance and find its way to one of these boxes, with the result that it would quickly be detected by the Post Office, electric supply, or other workers engaged in these boxes; and the Gas Company was promptly notified. As a matter of fact, there was close co-operation in this direction between the various authorities using the roads for mains purposes. In the same way, it was wrong to assume that because of the greater amount of traffic now using the roads the vibration was more serious, and that gas leakages, as a consequence, were more numerous. The fact was that modern road surfaces were very much smoother than the macadam road surfaces, coupled with which was the use of rubber-tyred vehicles. The net result was that there had been a reduction of vibration rather than an increase. In additon to the notifications to the Company by other authorities of gas leakages, the Gas Company itself had a number of men who spent their whole time watching for escapes which might remain undetected.

On the question of the liability to leakage from gas mains under modern conditions, Mr. Lacey said that from his experience he had definitely come to the conclusion that the danger of leakage from gas mains under modern roads was less than it was formerly. As confirming this opinion, he handed a table of leakages dealt with between the years 1904 and 1928; these leakages including not only notified leakages or actual leakages discovered by the Company's workmen, but all instances in which doubtful joints had been repaired, though there had been no actual leakage of gas. The figures related solely to the mains outside any premises supplied, and showed that, whereas in 1904, with 2116 miles of mains, the leakages per mile of main were 2·2, in 1928, up to Dec. 15, the figure was 1·7 with 4000 miles of mains.

The ATTORNEY-GENERAL said that, in looking at the table, it appeared that there was a cycle of increase and decrease, rather than a gradual decrease.

The CHAIRMAN remarked that he had noticed this point; but he wondered whether it might not have been due to the fact that at various periods between 1904 and 1928 the Gas Light and Coke Company had taken over a number of other undertakings whose mains might not have been kept in the same state of repair as those of the Gas Light and Coke Company; and that, as a consequence of dealing with them in the same efficient manner, the number of gas leakages decreased.

Witness said this would probably explain the reason why the figures varied slightly.

Mr. MILLER submitted, on behalf of the Gas Light and Coke Company, a statement giving details of every opening of the ground for any purpose by the Company's workmen between Kingsway and St. Giles' Circus during the last two years.

The ATTORNEY-GENERAL, however, was not content with information relating to High Holborn, Broad Street, and High Street merely, and intimated that he would like information also as to leakages which had occurred in certain streets which he enumerated, to the north and south of the three streets mentioned.

Mr. MILLER replied that the Attorney-General's requirements seemed to vary from time to time, and the statement submitted had been prepared in response to a letter he had written. It was the desire and the intention of the Company, however, to supply the Commissioners with any information they required.

After some little discussion the CHAIRMAN delimited the area with regard to which information should be given; and the Gas Company agreed to extend the statement accordingly.

Mr. *Lacey*, continuing his evidence, referred to an examination, which had been undertaken during the past year, of the 48-in. main which crosses the line of the Post Office tunnel within the affected area. One of the Company's leakage examiners had detected a small escape in one of the boxes at the corner of Hart Street and Museum Street, on the north side of New Oxford Street; and on investigation a leaky joint was discovered. Having remedied this, it was decided to test the main joint by joint, in accordance with the usual practice, by putting down a search bar at each joint, and using a leakage indicator. This examination was continued along the main, and on Dec. 10 the men had arrived at the point at which the main crossed beneath the Post Office tube. The searcher holes were made as near as possible to the joints, and the gas leakage indicator was applied to the holes. At places where leakages were indicated it was the practice to open the ground, test the joints with soap and water, and to re-set them, whether they actually leaked or not.

Witness exhibited a gas leakage indicator, which, he said, was very sensitive, and would register accurately a quantity of well under 1 p.ct. of coal gas. It was not so sensitive as the human nose, however.

Questioned with regard to the ability of human beings to detect small quantities of coal gas, he said that a man with experience could differentiate between minute quantities of coal gas and other gases, but the average consumer would attribute every smell to coal gas. To this latter remark the Attorney-General raised objection, but the Chairman said he understood Mr. Lacey to mean that every gassy smell was regarded by the average consumer as being due to coal gas. Mr. Lacey agreed, and added that when the average consumer noticed an unpleasant smell in his house, the first thing he did was to go to the Gas Company.

In reply to further questions, he said that invariably the Company were able to trace every leakage to its source; and when a source of leakage was found, it was not left until it was entirely remedied. The men were not content with merely one negative result on the leakage indicator, but continued to examine until they were wholly satisfied. The workmen were carefully instructed with regard to ventilation.

On the morning of the explosion, said Mr. Lacey, he was informed by his Chief Assistant, by telephone, at about 8.20, of what had occurred, and he proceeded at once to the site; his Chief Assistant being already there. There was an escape of gas from an 8-in. main on the north footway of Broad Street (near the Princes Theatre), and this gas was on fire. (The main was broken there by the explosion.) There was also a large escape of gas at the junction of Shaftesbury Avenue and Broad Street, and the gas seemed to come from the point at which the 24-in. main crossed above the Post Office tunnel. That escape was also stopped when the main was closed down. There were a number of the Company's men on the spot. He had communicated with the Company's contractors and district offices for additional men and material, and by about 9.45 there were over 100 men at work. He had discovered considerable volumes of gas escaping at the western end of High Street; the mains in that area having been very badly damaged. The tunnel had been shattered completely there, and the mains had been broken in more places than could be counted. Large numbers of men were set to work to isolate the areas in which gas was escaping.

He had heard the later explosion by the film company's building, and on walking in that direction he could see the flames in the building. The fire started at the bottom of the building, and in a few minutes had reached the top. When he first saw the flames they were coming out of the basement, but he could not say definitely whether there was any flame in the street away from the building.

Great care had had to be exercised in dealing with the mains, in order to ensure that explosions did not occur in the mains themselves.

In reply to Lieut.-Col. THOMAS, he said there was never a fire over the 24-in. main, though gas was escaping from it. He had been anxious to extinguish the fire over the 8-in. main, in order to reduce the possibilities of the gas escaping from the 24-in. main being ignited. The fire over the 8-in. main was extinguished at just about the time that the fire occurred in the film building, but there was no connection between the two occurrences. He was unable to say whether the first fire went out before the second one started.

DEALING WITH ESCAPES.

Cross-examined by the ATTORNEY-GENERAL with regard to the Company's organization for dealing with gas escapes, Mr. Lacey said that the Distribution Department dealt with these, among other things. There were five divisions in the Company's area of supply, each division being under the charge of a Divisional Mains Superintendent. The Superintendent had one Chief Assistant and a number of foremen under him. Each foreman kept a book, in which was recorded every leak which had occurred in his particular area.

At the request of the ATTORNEY-GENERAL, the book kept by the foreman in charge of the affected area was produced. It was called a "Ground Complaints Book." He commented that a number of them would be required if every smell in Holborn was attributed to gas. The book contained information showing the local authority having jurisdiction over the area concerned, the name and address of the complainant, the nature of the complaint, the signature of the inspector, the name of the man to whom the work was entrusted, and particulars of the work done.

Replying to questions, witness said that the immediate superior of the foremen perused these books daily. He believed that in the case of a serious escape the matter would be reported to the Divisional Superintendent at once. In addition to the entries in the foremen's books, a return was sent to Head Office every fortnight, recording all leakages; this return being made by the Divisional Mains Superintendent.

Mr. *A. G. T. Robson* (the Divisional Mains Superintendent concerned with the area affected) was questioned with regard to this matter, and said that each ganger made out a work sheet. A packet of these work sheets was made up each day and sent to his office.

The ATTORNEY-GENERAL asked to be provided with these packets covering a period of a month prior to Dec. 20, in relation to the affected area.

Mr. *Lacey*, replying to further questions, said that the work in connection with trunk mains was carried out by contractors, so that leakages from trunk mains were not recorded in the foremen's books.

At this point the ATTORNEY-GENERAL indicated that, until the further information he had asked was provided and examined, he was not able to help the Commissioners further.

Questions were asked by Mr. LIONEL WALFORD as to whether escapes could be detected by other means than by smell—as, for instance, by measurement—and Mr. *Lacey* replied that so far as they knew they could not.

Mr. WALFORD: If there were an escape in a pocket of the ground, which pocket was sealed, you might not discover it unless it became unsealed?

Witness: No.

At this point Mr. Lacey's evidence was discontinued for the time being.

The CHAIRMAN intimated that at a later stage the Commissioners would like to put to him some questions of detail with regard to the explosion, and with regard to the safety of mains generally. They would like to have evidence from the Holborn Borough Council and the London County Council with regard to the damage done to their

sewers, and some general information in respect of the London County Council pipe subways. They would also like some information as to the work done on the 48-in. gas main, and the condition of that main, and as to the composition of the gas supplied by the Company—*i.e.*, the proportions of coal gas and water gas, &c.

Mr. MILLER said that the members of the Gas Company's staff who had to deal with escapes in the area affected were present, and were prepared to give evidence when required.

The question of an adjournment was then discussed, and the ATTORNEY-GENERAL suggested an adjournment of ten days, so that the Gas Company could prepare the information they had promised, and the Post Office advisers could examine it.

The CHAIRMAN commented that, though the Commissioners were anxious to expedite matters, they could not proceed at such a pace that the case of either party would be prejudiced. He promised to make a definite pronouncement on the following day.

Another matter raised by Mr. MILLER was the Gas Company's anxiety to expedite the necessary work in the affected area; and both he and Mr. WALFORD expressed a desire to know as soon as possible whether the Post Office intended to reconstruct the tunnel, or what other course they intended to adopt. This, of course, must be a matter for discussion between the engineers; and the CHAIRMAN, while pointing out that the Commissioners had neither the power nor the inclination to interfere with the authorities concerned in this matter, suggested that the engineers might try to decide what they were going to do. He also intimated that in the event of an adjournment of the proceedings, the Commissioners would take the opportunity of visiting the site of the explosion from time to time.

The proceedings were then adjourned until Thursday.

In accordance with the Chairman's suggestion, the engineers of the Post Office, the Gas Company, the Holborn Borough Council, and the London County Council conferred in private immediately after the adjournment of the public proceedings on Wednesday.

Thursday, Jan. 3.

Further evidence from eye-witnesses was given. One of the witnesses, who occupies premises in High Street, said he had not noticed any escape of gas in his premises before the explosion, and that the gas supply was not interrupted by the explosion.

The CHAIRMAN said this concluded such eye-witness evidence as the Commissioners thought useful, but there was no desire to prevent any of the parties calling other evidence of a similar character.

Evidence was then given on behalf of the Holborn Borough Council.

Mr. *J. E. Parr*, Engineer and Surveyor to the Holborn Borough Council, said there was always a flow of water through the sewers, which were ventilated, thus preventing any possibility of stagnation. There was a free circulation throughout all the sewers of the Borough Council, which connected up with the L.C.C. main drainage. The sewers themselves were cement-rendered, making them air-tight. There had been no experience of any man ever being overcome by sewer gas either in Holborn or in Westminster.

Speaking of the complaint of Mr. Sinclair, of the G.P.O., as to a dangerous atmosphere existing in the Post Office tube, witness said he had been asked, on the occasion mentioned by Mr. Sinclair, to allow the Council's experienced sewer men to examine the tube; but he had not felt justified in placing the Council's men in danger, because he regarded the tube as likely to be more dangerous than the sewers. However, the sewer men were instructed to examine the sewers in the neighbourhood of the Post Office tube; and they reported there was nothing of which to complain.

Evidence was next called by the London County Council.

Mr. *Donald Charles Graham*, Divisional Engineer, in charge of the main drainage system of London, gave details of the main drainage system in the area of the explosion, and contended that it was impossible for sewer gas to percolate through sewers constructed in the manner of the main sewers in this area—and in view also of the ventilation that was given.

Speaking of the damage done to the sewers by the explosion, witness observed that all the damage seemed to come from the Post Office tube.

Mr. *R. D. Berry*, District Superintendent in charge of the L.C.C. sewers on the north side of the Thames, described the system of inspection and cleansing adopted. He said he had always found the air in the sewers in the area of the explosion good.

Mr. *Harold Hollings*, Chief Gas Chemist to the Gas Light and Coke Company, was then called to speak as to the composition of the gas supplied to the area affected by the explosion. He said that the gas in this area came mainly from Beckton, though a little might come from the Bromley Works and also the Bow Common Works. He handed in the following figures:—

Analysis of an average sample taken from the gas sent out from Beckton during the 24 hours ended 9 a.m., Dec. 20:

	P.Ct.		P.Ct.
Carbon dioxide	2·70	Hydrogen	46·00
Unsaturated hydrocarbons	4·18	Methane	22·20
Oxygen	0·56	Nitrogen	8·37
Carbon monoxide	15·99		

This was a mixture of about 38 p.ct. of carburetted water gas with 62 p.ct. of coal gas.

Analysis of an average sample taken from the gas sent out from Bromley during the 24 hours ended 9 a.m., Dec. 20:

	P.Ct.		P.Ct.
Carbon dioxide	3·2	Hydrogen	47·3
Unsaturated hydrocarbons	4·0	Methane	21·3
Oxygen	0·7	Nitrogen	7·6
Carbon monoxide	15·9		

This was a mixture of about 35 p.ct. of carburetted water gas with 65 p.ct. of coal gas.

Analysis of an average sample taken from the gas made at Bow Common during the period Dec. 14 to Dec. 21:

	P.Ct.		P.Ct.
Carbon dioxide	3·3	Hydrogen	45·9
Unsaturated hydrocarbons	4·0	Methane	21·0
Oxygen	0·7	Nitrogen	8·1
Carbon monoxide	17·0		

This was a mixture of approximately 23 p.ct. of carburetted water gas and 77 p.ct. of coal gas.

These proportions of carburetted water gas and coal gas, said Mr. Hollings, gave a calorific value slightly above the Company's standard of 500 B.Th.U.

The CHAIRMAN, referring to the suggestion made during the inquiry that there had been a distinct change in the atmosphere of the Post Office tube since 1926, asked witness if there had been any change in the constitution of the Gas Light and Coke Company's gas, assuming merely for the sake of argument—and, of course, he did not assume it in fact—that the Company's gas did get into the tube.

Mr. *Hollings* said he could not think of any change. He had the analyses of gas over the whole period, and no change was indicated.

The CHAIRMAN: Assuming that this gas, which I take it smells very distinctly as coal gas, leaked slightly into a confined space—not an absolutely air-tight space—is it possible for it to lose its smell without losing its explosive capacity?—It might possibly lose its smell if any absorbent material was present. I am thinking at the moment of charcoal. Whether the soil is sufficiently absorbent to remove the smell I am not prepared to say.

The CHAIRMAN: It might lose its smell without losing its properties *qua* explosion?—It conceivably might.

The CHAIRMAN: I am not suggesting that this happened for a moment. I only wanted to clear up a point that is present in my mind.

Lt.-Col. THOMAS: Would the presence of lead have any effect in the direction of absorbing the smell?—I should say certainly not.

Might it not combine with the sulphuretted hydrogen?—There is no sulphuretted hydrogen in this gas. We are under statutory obligation to remove all the sulphuretted hydrogen.

Mr. *G. Davis*, Trunk Mains Inspector to the Gas Light and Coke Company, gave evidence with regard to the 48-in. main which passes through the area. He said there were no branches from that main anywhere in the explosion area. Work was being done by the Company's contractors upon this main in consequence of a trace of a leakage in a Gas Company's receiver box at the corner of Hart Street and Museum Street, which had been found in February, 1928. A slight leak was discovered, and the joint of the 48-in. main was made good a few days later. As a result of that leak, it was decided to inspect all the joints, in sequence, of the 48-in. main; the distance between the joints being usually 12 ft., except in special cases. That work proceeded onwards from February, 1928, by Messrs. Press, under his supervision; the work being inspected by himself every day. It so happened that the work had reached the Princes Theatre on the day of the explosion, and he was there at the time. By that date, 58 separate joints had been inspected. The joints were spigot and socket; a gasket of spun yarn being forced in, lead being then poured in and finally caulked. Witness explained the methods adopted in re-making joints, and also temporary hand caulking, and claimed that perfectly gas-tight joints were made in this way.

Speaking of the work on the 48-in. main outside Princes Theatre, witness remarked that, when the excavation was made early in December, there was no sign of leakage until all the earth had been scraped away from the joint, and the soap and water test applied, when a minute leakage was apparent. The main at this point passed under the Post Office tube and sewers, and at another joint in the same spot a further slight leak was discovered. These leaks, however, were easily repaired. He himself was down in this excavation on the day before the explosion; and there was no trace of gas there then.

The ATTORNEY-GENERAL cross-examined.

Witness said that from Hart Street to Broad Street all the joints showed a slight leak; but they were just the normal leaks that were to be expected from the loosening of the joints. He agreed that smaller mains sometimes broke through being unsupported over a certain length; but he had had no experience of this with the larger mains.

At the time of the first explosion on Dec. 20, the contractors' nine men working on the 48-in. main outside Princes Theatre had just gone to breakfast, but he would not agree with the Attorney-General that if a workman threw down a pickaxe in his hurry to get to his breakfast, and the pickaxe hit the main, a spark might be caused which conceivably could cause an explosion.

Replying to Mr. MILLER,

Witness said that, if there had been a broken smaller main within a dozen yards of the excavation from the 48-in. main, it would certainly have disclosed itself to the men working in the excavation, and to himself, as he was constantly down there.

Answering the CHAIRMAN,

Witness agreed that at every joint up to Princes Theatre a slight leak was noticed. There was no breakage of the pipe, however, and the amount of gas coming from any leaky joint was extremely small.

The CHAIRMAN asked if it were possible to estimate the quantity of gas leaking from such a joint in 24 hours.

Witness replied that it was so small that it would not be 1 c.ft. per day. In many cases, there were only a few bubbles shown by the soap and water test; and in others the bubbles showed over a distance of only one or two inches.

Witness further said there had been no necessity to work on the 24-in. main in this area between 1926 and the present date. He added that the repairs to the 48-in. main were routine repairs, and

were not the subject of any special instructions due to special circumstances.

The ATTORNEY-GENERAL asked if it was Mr. Miller's case that there were no breaks in any of the Gas Company's mains in the vicinity of Princes Theatre before the explosion.

Mr. MILLER: I do not know what my friend means by "my case."

The ATTORNEY-GENERAL said he was merely referring to the facts, and was asking whether there were any breaks in any of the Company's mains in the neighbourhood of Princes Theatre immediately prior to the explosion.

Mr. MILLER: I have no suggestion of any breaks in any of the Company's mains in this area immediately prior to the explosion. My case, so far as I have a case—because I am here at the moment trying to elicit facts—is that all the mains in this neighbourhood have been carefully laid and carefully watched, and so far as we know were in perfect order until the explosion in the Post Office tube broke them. If my learned friend has some reason to suspect that prior to the explosion there was a broken main, and can indicate where, I will take every opportunity of obtaining every piece of information that may be of assistance about the matter.

The ATTORNEY-GENERAL: I have no indication to which I would draw my learned friend's attention, except what I regard as the very important evidence about the explosion outside.

Mr. MILLER said he could give his assurance that nothing was being kept back. The Gas Company had further evidence to give concerning the inspection of the mains, and a witness was available at once; but he felt it would be better to wait, before giving that evidence, until the mass of documents which had to be inspected had been gone through. It appeared to him little use to ask a witness to deal with this matter until all the documents had been collected.

The CHAIRMAN said that the Commissioners felt that a stage had been reached at which it would be necessary to wait for further information to be prepared. At a later stage he proposed to ask the Metropolitan Water Board to give a small amount of evidence as to what breaks had occurred in their mains owing to the explosion. He would also ask the electric supply companies, which were involved, for similar evidence as to the displacement of their mains, in so far as this might indicate some point of value in endeavouring to arrive at a conclusion.

After a short discussion, the proceedings were then adjourned until Monday, Jan. 21.

WALTHAM AND CHESHUNT GAS COMPANY.

Fifth Annual Co-Partnership Dinner.

There was an interesting gathering at the Town Hall, Waltham Abbey, on the evening of Dec. 27, on the occasion of the fifth annual co-partnership dinner in connection with the Waltham and Cheshunt Gas Company. Mr. LIONEL E. BURTON (Chairman of the Company) presided, supported by Messrs. Henry Woodall (Chairman of the Tottenham and District Gas Company, which took over the Waltham Company on Jan. 1), F. Smallbone (Secretary, Engineer, and Manager of the Waltham Company), H. C. Smith and E. J. K. Fussell (Engineer and Secretary respectively of the Tottenham Company), and several local councillors.

The CHAIRMAN, speaking to the employees (all of whom are co-partners in the Company), remarked that this would be the last dinner to which the Directors of the Waltham and Cheshunt Company would have the pleasure of inviting those present. The Waltham and Cheshunt undertaking, as from Jan. 1, would become absorbed into that of their much larger neighbour. For the district at large it was the best step that could have been taken, and they must never forget that one of the chief interests to be served was that of the consumer of gas. This was, in fact, the very *raison d'être* of the gas companies' existence—to supply gas which was not merely a lighting agent, but also a heating agent. He wished to emphasize that the future of the Company, as part and parcel of the Tottenham Company, would be greater than it had been in the past. Consumers must, of necessity, benefit, because the larger Company, with its greater resources, would be able to extend mains, and give better service in many ways. He felt convinced that the price of gas would be much lower throughout the Cheshunt and Waltham area as time proceeded. Speaking of the co-partnership scheme, he observed that it had proved very successful. The Directors had been very pleased with it, not only because of the financial benefit it had been to the co-partners, but because it had produced between Directors, officials, and employees a better spirit and a better understanding with one another. Though the scheme had only been in operation for six years, the amount of profit placed to the credit of the co-partners' trustees was £2815, partly invested in the shares of the Company. Each co-partner who had been with the Company for the last six years, and who had been a co-partner during that period, had standing to his credit a sum of £76 12s. 3d. That was only the beginning. At the end of 40 years, to which the younger employees could look forward, if gas was sold as freely, and profits were made on more or less the same scale, each co-partner would have something like £1200 standing to his credit. Furthermore, the co-partners would be invited to be co-partners in the Tottenham Company.

Mr. SMALLBONE, replying to the toast of his health, expressed his appreciation of the help given him to bring about the results they had collectively attained. The balance-sheet showed there had been material profit, and this could not have been achieved if the employees had not been supported by the Directors, who had given the workers practically every opportunity to do their best. While the Chairman had mentioned the question of the absorption of Waltham by the larger Company, he omitted to mention that the Directors, in their generosity, had arranged that every worker could go straight into the new Company free of all expense. In the course of the next week or two he hoped the Chairman would come down to Waltham, and would hand the men the certificates which would enable them to enter into the Tottenham partnership scheme straight away.

The CHAIRMAN then proposed the toast of "The Amalgamated Companies," expressing the hope that progress would become more and more marked for the sake of the partners. With the toast he coupled the name of Mr. Henry Woodall, the Chairman of the Tottenham Company. Mr. Woodall occupied a very prominent position in the gas industry, he observed. He was Deputy-Chairman of the Gas Light and Coke Company, Chairman of the British Gas Light Company, and Chairman of the Ipswich Gas Company. Mr. Woodall and his fellow Directors had met the Waltham Company most handsomely, and, in consequence, the Waltham Directors had been able to look after the interests of their employees and co-partners.

Mr. WOODALL, replying, said how much the Tottenham Directors appreciated the way in which Mr. Burton had met them. He was much impressed by the fact that Mr. Burton and Mr. Smallbone were so mindful of their co-partners. Tottenham was very pleased to fall in with their views, because the Tottenham Company had a co-partnership scheme of much longer standing. And when the £76 per head, mentioned by Mr. Burton, was converted into Tottenham stock it would be increased to £85.

The toast of "The Visitors" was proposed by Mr. SMALLBONE, and responded to by Messrs. SMITH and FUSSELL.

GAS REGULATION ACT APPLICATIONS.

AMENDING ORDERS.

Croydon Gas Company.

The Board of Trade give notice that the Croydon Corporation have made application under sub-section (3) of section I. of the Gas Regulation Act for an Amending Order revising the powers of charging authorized by the Croydon Gas (Charges) Order, 1921, by reducing the standard price prescribed by that Order.

Any person affected desiring to make representations with regard to the application may do so by letter addressed to the Director of Gas Administration, Board of Trade, Great George Street, London, S.W. 1, not later than Jan. 15.

DECLARATIONS OF CALORIFIC VALUE.

Salford Corporation.—500 B.Th.U. (April 1.)
Newmarket Gas Company.—500 B.Th.U. (April 1.)

SPECIAL ORDER.

East Hull Gas Company.

To authorize the Company to use scheduled lands for gas purposes, to make new provisions relating to the issue of capital, and for other purposes.

DIARIES, CALENDARS, &c.

Since going to press with the last number of the "JOURNAL," diaries, calendars, or other office requisites have been received from:

Holman Bros., Ltd., Camborne.
Lunt Bros., Colmore Row, Birmingham.
W. Parkinson & Co., Cottage Lane, City Road, London, E.C.
Peckett & Sons, Ltd., Atlas Locomotive Works, Bristol.

REGISTER OF PATENTS.

APPLICATIONS FOR PATENTS.

[Extracted from the "Official Journal" for Dec. 28.]

Nos. 37,163—38,006.

BABCOCK & WILCOX, LTD.—"Combined gas and oil burners." No. 37,668.
BAGLIN, C. A.—"Coke ovens." No. 37,165.
DIAMOND, W.—"Coke ovens." No. 37,689.
LENNON, T. J.—"Gas regulating valves." No. 37,744.
RICHARDSON, W. H.—"Gas cookers." No. 37,895.
STANDARD GAS FITTINGS COMPANY, LTD.—See Lennon, T. J. No. 37,744.
STONES, LTD.—See Richardson, W. H. No. 37,895.

[Extracted from the "Official Journal" for Dec. 31.]

Nos. 38,007—38,593.

BARRETT COMPANY.—"Operation of retort gas plants." No. 38,163.
COLLIN & CO.—"Coke ovens." No. 38,327.
CROFT, C. M.—"Gas retorts." No. 38,494.
ELLIS, H. G.—"Gas brackets." No. 38,064.
GILL, G. M.—"Coke ovens." No. 38,093.
IMPERIAL CHEMICAL INDUSTRIES, LTD.—"Process of producing water gas." No. 38,515.
MORRISON, J. A.—"Valves for gas mains." No. 38,565.
SCHAEFER, J.—See Collin & Co. No. 38,327.
SINCLAIR, C. L.—See Croft, C. M. No. 38,494.
SOUTH METROPOLITAN GAS COMPANY.—See Ellis, H. G. No. 38,064.
STILL, C.—"Distributing plate for gas washers." No. 38,302.
TYRER, D.—See Imperial Chemical Industries, Ltd. No. 38,515.
WATTS, H. G.—See Imperial Chemical Industries, Ltd. No. 38,515.
WEST, E. & F. J.—"Coke extracting mechanism for vertical retorts." No. 38,413.
WEST'S GAS IMPROVEMENT COMPANY, LTD.—See West, E. & F. J. No. 38,413.

COAL TRADE REPORTS.

From Our Own Correspondents.

NORTH-EAST COAST.

After the dislocation of the extended Christmas and New Year holidays, the position is rather difficult to assess. Provided tonnage arrivals are steady, the prospects of the next few weeks are fairly good, though not much new business has been put through in the last fortnight. It is to be expected, however, that the market will settle down now; and the outlook, judged by the closing period of last year, may be regarded hopefully. While some of the better-class collieries are well sold for this year, it cannot be said that there has been much general inclination on the part of buyers to contract far ahead at current prices. Any indication of a change of policy in this direction on the part of foreign consumers could be regarded as the best sign of all.

Superior gas coals are well stemmed, and Wear Specials are firmly quoted at 15s. to 15s. 3d., and best qualities at 14s. 9d. Seconds are called 13s. 3d. to 13s. 6d., and are in variable demand. Coking coals show slightly more activity, but secondary qualities still find it difficult to keep going. Quotations range between 13s. and 13s. 6d. In unscreened steams, best qualities quote up to 14s. 3d., and seconds and others are finding rather more trade at 13s. to 13s. 3d., though there is still ample coal at those prices. Northumberland large steams are still enjoying good trading, and best makes are quoted firmly at 14s. 3d. to 14s. 6d.

Gas coke is still very quiet, and is nominally 18s. 6d. f.o.b. for shipment.

YORKSHIRE AND LANCASHIRE.

Collieries have scarcely recovered from the Christmas and New Year holidays, and business is not yet moving in the usual channels. Industrial fuel is in fair request, with recent prices maintained. Some figures have been slightly increased in view of the great demand prior to the holidays; but it is anticipated that more normal prices will rule during the next few weeks.

With the slightly increased quota for January, there is good prospect for the trade keeping to the December level. Export conditions remain unaltered.

MIDLANDS.

There is little indication of any new momentum in the trade. It is claimed, however, that the restriction of output under the Five Counties Scheme to 60 p.ct. of standard is having its effect in bringing about a changed market equilibrium. It is even suggested that, so far as coke is concerned, collieries are getting a stronger grip on prices. There is not sufficient evidence on which to come to a conclusion, however.

Coke supplies, on which Derbyshire and Northants blast-furnaces depend, are very largely under the control of the associated collieries. It would seem a simple matter, therefore, for them to put up their prices. Nevertheless, they are not enforcing their full claims to the rebate on transport. A compromise has been arrived at in a number of cases, under which the concession will be shared. As to cases in which cokeries insist that the whole of the rebate belongs to them, it remains to be seen whether their strength is sufficiently augmented to enable them to force the position.

Coal prices are where they were before Christmas. The industrial demand remains rather quiet. Good qualities of household coal have been selling well, but not well enough to affect pit-head values.

A brisker call for slacks and nuts for boiler use has given a slight fillip to one department.

CONTRACTS OPEN.

Gas Liquor.

The Henley-on-Thames Gas Company invite tenders for their gas liquor. [See advert. on p. 117.]

Steel-Framed Building.

The Gas Department of the City of Bradford invite tenders for the construction and erection of a steel-framed brick-panelled building. [See advert. on p. 117.]

Reduction in Price at Dewsbury.—Announcing a reduction in the price of gas at Dewsbury, on Jan. 3, Alderman J. McCann (Chairman of the Gas Committee) said the price was lower by 2d. per 1000 c.ft. The improvements at the works had been completed. The Committee and the Engineer and Manager (Mr. H. L. Bateman) were hopeful that a further reduction would be possible at an early date, and also that something might soon be done to lessen the disparity between the charge of 3s. 9d. per 1000 c.ft. in one part of the borough and 4s. 7d. in another.

British Industries Fair at Castle Bromwich.—The Birmingham Corporation will again take an active part in the forthcoming British Industries Fair at Castle Bromwich. At a joint meeting on Jan. 2 of representatives of the General Purposes Committee of the Corporation and of the Birmingham Chamber of Commerce, arrangements were made for the visit of mayors of various cities and towns, and other civic representatives. Afterwards the visitors will be entertained at dinner at the Council House in the evening. There will be an official visit to the Fair on Feb. 25 by members of the City Council; and the Lord Mayor will hold a reception for exhibitors, buyers, and others on Feb. 26.

TRADE NOTES.

C. & W. Walker, Ltd., to Supply Purifiers for Bradford.

The Bradford Corporation Gas Committee have accepted the tender of Messrs. C. & W. Walker, Ltd., of Donnington, Wellington, Salop, for the supply of five cast-iron purifiers with valves, connection, &c., complete, required for the purifier extension scheme at the Birkshall Works.

John J. Griffin & Sons, Ltd.

Messrs. John J. Griffin & Sons, Ltd., announce that their business has been carried on, as from Dec. 15, in the name of "Griffin & Tatlock, Ltd.," combining their business and that hitherto carried on by Messrs. Baird & Tatlock, Ltd., of Glasgow, Manchester, Edinburgh, and Liverpool, with which Company Messrs. Griffin have acted in close association for some years. The conduct of the business is unchanged.

Davison-Waller Plant for Sowerby Bridge.

Messrs. Davison & Partner, Ltd., of Queen Anne's Gate, S.W. 1, have received an order from the Sowerby Bridge Urban District Council for one unit of Davison-Waller carburetted water gas plant of a capacity of 500,000 c.ft. daily. The plant is complete with washing, scrubbing, and condensing apparatus, electrical hoisting and traversing coke lift for feeding the generator, and a patent "Centriflovane" grit catcher.

Cookers and Meters for Belfast.

The Belfast Corporation have accepted the tender of Messrs. R. & A. Main, Ltd., Gothic Works, Falkirk, for the supply of gas cookers, heating stoves, &c., for a period of two years commencing Feb. 1 next. The contract for the supply of gas meters from Feb. 1 till Jan. 31, 1931, has been equally divided among Messrs. Parkinson & Cowan (Gas Meters), Ltd., Messrs. Thos. Glover & Co., Ltd., and Messrs. Alder & Mackay, Ltd.

Bell's United Asbestos Company, Ltd.

With the main object of bringing together the asbestos-cement interests of this Company and its Group with those of Turner & Newall, Ltd., an amalgamation between the two Companies has been effected. It is anticipated that the unification of these interests will yield considerable economies in both production and distribution. In packings, jointings, and general engineering supplies, however, it was not found possible to harmonize the sales policy of Turner Brothers Asbestos Company, Ltd.—a branch of Turner and Newall, Ltd.—with that of Bell's United Asbestos Company, in that the former make no distribution of these products direct to the users. It was agreed, therefore, to dispose of the goodwill in this trade to an independent Company trading under the style of "Bell's Asbestos and Engineering Supplies, Ltd.," who will be responsible for the execution of all outstanding orders.

CURRENT SALES OF GAS PRODUCTS.

The London Market for Tar, Tar Products, and Sulphate.

LONDON, *Jan.* 7.

The market for pitch is quiet, and little business is reported. The current value is about 37s. 6d. per ton.

Creosote is unchanged at about 7d. per gallon.

Pure toluole is in demand, and is firm at about 2s. 1d. per gallon.

Pure benzole is about 1s. 9d. to 1s. 10d. per gallon, and 95/160 solvent naphtha 1s. 5d. to 1s. 6d. per gallon.

Pyridine is quiet at about 4s. 3d. per gallon.

Tar Products in the Provinces.

Jan. 8.

Markets for tar products generally are still very quiet indeed.

There has been little or no business in pitch. Dealing has again been done for the first few months of the year on a basis of 35s. f.o.b., and Continental manufacturers generally refuse to offer more than 34s.

Creosote oil is quiet, and orders for home consumption are very difficult indeed to obtain.

Water-white products are steady with a fair demand.

Crude carbolic is being sold at 1s. 10d. to 1s. 11d. per gallon.

Cresylic acid is quiet, and orders are scarce.

Naphthalene is unchanged.

The average prices of gas-works products during the week were: Gas-works tar, 22s. 6d. to 27s. 6d. Pitch—East Coast, 34s. to 35s. f.o.b. West Coast—Manchester, 29s. to 29s. 6d.; Liverpool, 31s. to 32s.; Clyde, 31s. to 32s. Toluole, naked, North, 1s. 5d. to 1s. 6d. nominal. Coal-tar crude naphtha, in bulk, North, 9d. to 10d. Solvent naphtha, naked, North, 1s. 1½d. to 1s. 2d. Heavy naphtha, North, 1s. to 1s. 0½d. Creosote, in bulk, North, liquid, 4⅞d. to 4¼d. salty, 4¼d. to 4⅜d.; Scotland, 4¼d. to 4⅜d. Heavy oils, in bulk, North, 8¼d. to 8⅜d. Carbolic acid, 60 p.ct. 1s. 10d. to 1s. 11d. prompt. Naphthalene, £13 to £15; salts, £5 to £5 10s., bags included. Anthracene, "A" quality, 2½d. per minimum 40 p.ct., purely nominal; "B" quality, unsaleable.

Benzole Prices.

The following are considered to be the market prices to-day:

	s. d.		s. d.	
Crude benzole . . .	0 10	to	0 10½	per gallon at works
Motor " . . .	1 4	"	1 4½	" " "
90 p.ct. " . . .	1 7	"	1 8	" " "
Pure " . . .	1 10	"	1 11	" " "

Electricity Failure at Stafford.—On Saturday evening last, shortly after nine o'clock, there was a failure of a 1500-KW. generator at the power house from which Stafford's entire supply of electricity was being drawn at the time. The supply was restored about 9.30 p.m.

Institution of Engineers-in-Charge.—To-night, at 7.30 p.m., Dr. J. S. Owens, M.D., Assoc.M.Inst.C.E., will address a meeting of the Institution on the subject of "Smoke Abatement." The meeting will be held in the St. Bride Institute, Fleet Street, E.C. 4, and Dr. W. R. Ormandy will preside.

Gas Explosion at Lerwick.—While a connection was being made from a gas main in Commercial Street, Lerwick, to an adjoining shop, on Dec. 27, escaping gas lodged in the open drains under the premises, and was ignited by a fire in the shop. An explosion occurred, blowing up the floor and doing considerable damage.

Illuminating Engineering Society.—The Twentieth Anniversary Dinner of the Illuminating Engineering Society will be held at the Trocadero Restaurant, Piccadilly, W., on Wednesday, Feb. 13, at 7 for 7.30 p.m., when the President (Mr. C. C. Paterson, O.B.E.) will preside. At the conclusion of the dinner a hall will be available for dancing.

Royal Society of A .—At the Royal Society of Arts, John Street, Adelphi, W.C. 2, on Wednesday, Jan. 16, at 8 p.m., Prof. Charles R. Darling, A.R.C.Sc.I., F.I.C., F.Inst.P., will give an address on "The Domestic Smoke Problem: A Practical Solution." Dr. Margaret Fishenden will preside, and a number of modern domestic heating appliances will be exhibited.

"Colour and Its Applications."—This is the title of a paper which will be read by Dr. L. C. Martin at a meeting of the Illuminating Engineering Society on Jan. 22. The meeting will take place at the Home Office Industrial Museum, Horseferry Road, Westminster, S.W. 1, at 6.30 p.m. An opportunity will be afforded of inspecting the lighting exhibits in the Museum.

Showrooms Designed by the Nautilus Company.—The new showrooms recently opened by the Swindon United Gas Company and the Lincoln Corporation Gas Department were designed and executed by the Nautilus Company, of Luton, who are also carrying out similar work for the Grimsby Gas Company. The Grimsby showrooms will be completed within the next few weeks.

Heaton's Handbook.—The Heaton Publishing Company, of Toronto, Canada, have just produced the twenty-fifth annual edition of their Handbook for 1929. The publication is otherwise known as "The National Desk-Book," and contains considerable financial, commercial, and industrial information, maps, tables, customs and excise, &c., data, at the net price of $3.50 post paid, with 10 p.c. discount for five or more copies.

Hemel Hempsted District Gas Company.—The Directors of the Hemel Hempsted District Gas Company, as announced in our advertisement columns to-day and last week, have instructed Messrs. A. & W. Richards, of 37, Walbrook, E.C. 4, to offer for sale by tender £6000 of 6 p.c. redeemable debenture stock (to be redeemed at par on Jan. 1, 1938), and also £6000 "C" ordinary stock (ranking for a standard dividend of 6 p.c. subject to the sliding-scale equally with the existing "C" ordinary stock now receiving this rate). Tenders for the stock must arrive at Messrs. Richards not later than Wednesday, Jan. 16.

Progress at Congleton.—Developments in the municipal services in Congleton have mainly concerned the Gas Department. Consequent upon the continued increase in the sales of gas, the Town Council decided to instal a new purification plant and an exhausting plant at an estimated cost of £3420, and this work is now nearing completion. The increase in the output of gas over the previous twelve months amounts to 1,600,000 c.ft., and during the same period the price has been reduced by 6d. to 3s. 1d. per 1000 c.ft. for ordinary purposes, and to 2s. 1¼d. per 1000 c.ft. (net) for power and industrial purposes. This reduction was made possible by the net profit on the gas undertaking for the year ended March 31, 1928, which amounted to £3500.

Presentations to Birmingham Employees.—Presentations of illuminated addresses on retirement were made by the Lord Mayor to fourteen employees of the Birmingham Gas Department at a meeting of the Gas Committee on Dec. 31, under the Chairmanship of Alderman J. H. Lloyd. The total length of their service was over 400 years, the individual periods ranging from 30 to 46 years. The recipients were: P. E. Genders, rental clerk, who entered the Corporation service in October, 1883; W. Bates (37 years' service); W. Boswell (39); R. Chamberlain (38); T. W. Earl (46); J. Faulkner (32); J. Fletcher (35); J. Fletcher (34); J. Green (37); J. Jennings (37); W. Lowe (42); E. Meads (37); S. Sarth (38); J. Yates (36); and A. Smith (37).

Rhineland Gas Disaster.—Five persons have already lost their lives, and over thirty are in greater or lesser measure suffering, as a consequence of a serious leakage of gas in the Rhineland town of Duisburg. The escape was first discovered on Jan. 1 in a coal cellar. Workmen were summoned, but declared that the leakage could have nothing to do with the municipal gas main, and that it must come from the great Ruhr main, the pipes of which had been laid under the street in question about six weeks previously; so nothing further was done. Some hours later passers-by noticed a strong smell of gas in the vicinity, and, the police having been warned, the surrounding houses were entered, and the victims discovered. It is thought that, owing to the hardness of the ground, the gas, unable to escape through the road, found its way into the houses by way of the trenches in which the house service pipes were laid.

Cantor Lectures, 1929.—At the Royal Society of Arts, John Street, Adelphi, W.C. 2, at 8 p.m., Dr. C. H. Lander, C.B.E., D.Sc., M.Inst.C.E., F.Inst.P., will deliver a series of three Cantor Lectures on "The Treatment of Coal" on Monday evenings, Jan. 21 and 28, and Feb. 4. The subjects dealt with on the three dates will be "The Use of Coal in its Raw State," "High-Temperature Carbonization Process and Coke Treatment," and "Low-Temperature Carbonization" respectively.

Explosion at London Gas-Works.—Thirteen men received minor burns when a gas escape fired on Jan. 7 at the Gas Light and Coke Company's Works at Nine Elms Lane, Battersea. In each case the burns, which were mainly to the face and hands, were only slight. Some of the men were treated at hospital, but were not detained. In an official statement, the Gas Light and Coke Company gave the following explanation of the accident: "In the course of carrying out some work which was being done in connection with a new laboratory, some gas was accidentally allowed to escape from a pipe which had been disconnected. The gas ignited, causing a slight explosion. A number of men engaged on the work at the time received slight burns, for which they received attention at St. Thomas's Hospital, and they were afterwards sent home."

Safety in Mines Research Board.—The Secretary for Mines announces the following changes in the constitution of the Safety in Mines Research Board. Sir Thomas Mottram, C.B.E., Sir Richard Redmayne, K.C.B., and the Rt. Hon. Thomas Richards retired at the end of the year, on the completion of their period of office. The ordinary rule is that retiring members are not eligible for re-appointment for twelve months after retirement; but in Sir Thomas Mottram's case there are exceptional circumstances which have justified a departure from the rule. As Chairman of the Board's Committee on the Support of Workings, he is actively engaged in an extensive and difficult investigation into the methods of reducing accidents from falls of ground; and Commodore King regards it as essential that this work should not be interrupted by his immediate retirement. In these circumstances he has re-appointed Sir Thomas Mottram for a period of two years.

Proposed Extensions at Aberdeen.—The Gas Committee of the Aberdeen Town Council have under consideration a statement by the Gas Engineer and Manager (Mr. S. Milne) that it would be necessary to proceed at an early date with a further extension of the carbonizing plant at the gas-works. The natural site for the new retort house would be upon the east half of the old horizontal retort house. This would entail scrapping about half of the old plant, with a yield of 1,400,000 c.ft. per diem, to give place to a new plant capable of producing nearly 4,000,000 c.ft. per diem, leaving out of account the remaining old horizontal retorts. The total capacity of the coal carbonizing plant would then be 6,900,000 c.ft. per diem. This winter's daily output was approaching 6 million c.ft. The Committee recommended that the Gas Engineer and Councillors Catto and Swinney be appointed to visit the South to inspect in actual operation some of the latest carbonizing plants in the country.

The Walsall Gas Department propose to erect a 4-lift spiral-guided gasholder.

The Keighley Corporation have summoned 65 people for non-payment of gas and gas oven rates.

The employees of the Glasgow Corporation Gas Department have contributed over £155 to local charities during the past year.

Mr. R. T. Rogers (30), of Hightown, Wrexham, a foreman at the Wrexham Gas-Works, died on Jan. 3 in hospital, as a result of severe burns received by falling on to the hot bars of a furnace.

The Carlisle Corporation swimming baths, which are among the few inland swimming baths in the country which are open all the year round, were erected out of the profits of the city's gas undertaking.

It was reported at a meeting of the Plymouth Corporation Gas Committee, on Jan. 3, that the output of gas for December had shown an increase of 5·18 p.ct. as compared with the corresponding period of the previous year.

Miss L. Parkyn, of London, the holder of a first-class diploma in cookery, gave daily cookery demonstrations with a Standard gas cooker at the showrooms of the Plymouth and Stonehouse Gas Company in George Street last week.

The Bradford Corporation Baths Committee have appointed members to obtain all available information as to the use of gas (and also electricity) for water heating purposes, instead of solid fuel fired boilers, at new district public baths being erected at Thornton.

Ninety children of the Department's employees were entertained by the Social and Welfare Club of the Plymouth Corporation Gas Department at a Christmas tea held at the Criterion Restaurant, Devonport, on Wednesday, Jan. 2. The Chairman, Major J. Clifford Tozer, and several other members of the Gas Committee were present.

It was reported to the Gas, Water, and Electricity Committee of the Barry Council, on Dec. 31, that the canvass for consumers under the new electricity scheme in certain districts had proved extremely disappointing. From 515 householders there had been only 59 acceptances, as against 294 definite refusals. The Engineer (Mr. T. E. Franklin) said that Barry's cheap gas was operating against electricity.

STOCK AND SHARE LIST.

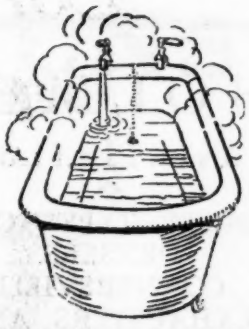
[For Stock Market Report, see earlier pages.]

Issue.	Share.	When ex-Dividend	Dividends. Prev. Hf. Yr	Dividends. Last Hf. Yr.	NAME.	Quotations. Jan. 4.	Rise or Fall on Week.	Transactions Lowest and Highest Prices.
£			%p.a	% p.a.				
171,978	Stk.	Aug. 30	5	5	Aldershot 5 p.c. max. C.	72—77	..	..
412,992	,,	,,	4	4	Do. 4 p.c. Pref.	69—72	..	71
1,551,868	,,	Sept. 27	7	7½	Alliance & Dublin Ord.	96—99	..	98½—99
374,000	,,	July 12	4	4	Do. 4 p.c. Deb.	63—66	..	..
522,554	,,	Aug. 30	7	7	Barnet Ord. 7 p.c.	114—117	..	..
300,000	1	Oct. 11	1/7½	1/4½	Bombay, Ltd.	20/—22/-	..	..
170,000	10	Aug. 30	8½	8½	Bournemouth 5 p.c.	12½—13½	..	..
500,050	10	,,	7	7	Do. B 7 p.c.	12½—13	..	12⅝—12⅝
375,000	10	,,	6	6	Do. Pref. 6 p.c.	11—11½	..	..
50,000	Stk.	July 12	3	3	Do. 3 p.c. Deb.	56—59	..	..
162,025	,,	,,	4	4	Do. 4 p.c. Deb.	75—78	..	..
857,900	,,	Aug. 30	7½	7½	Brighton & Hove 6 p.c. Con.	115—118	..	..
341,880	,,	,,	6⅔	6⅔	Do. 5 p.c. Con.	101—104	..	..
1,287,500	,,	July 26	5	5	Bristol 5 p.c. max.	92—94a	+1	..
885,000	,,	Sept. 27	7	8	British Ord.	115—118	..	116½
100,000	,,	Dec. 20	7	7	Do. 7 p.c. Pref.	115—120*	+5	113
120,000	,,	,,	4	4	Do. 4 p.c. Red. Deb.	73—76*	..	..
200,000	,,	,,	5	5	Do. 5 p.c. Red. Deb.	93—96*	..	..
100,000	10	Dec. 6	8	6	Cape Town, Ltd.	7⅞—8⅞	..	..
100,000	10	Oct 25	4½	4½	Do. 4½ p.c. Pref.	6¾—7½	..	..
150,000	Stk.	Dec. 20	4½	4½	Do. 4½ p.c. Deb.	71—76*	..	..
226,860	,,	July 26	6	6	Cardiff Con. Ord.	97—100	..	..
337,860	,,	June 28	7½	7½	Do. 7½ p.c. Red. Deb.	100—103	..	100—102½
167,150	,,	Aug. 16	6⅔	5	Chester 5 p.c. Ord.	88—93b	..	..
79,185	1	Oct. 11	1/-	1/-	Colombo Ltd. Ord.	36/—38/	..	..
24,495	1	,,	1/4½	1/4½	Do. 7 p.c. Pref.	21-/—23/-	..	..
375,402	1	Oct. 11	1/9½	1/9½	Colonial Gas Assn. Ld. Ord	24/—26/-	..	..
187,848	1	,,	1/7½	1/7½	Do. 8 p.c. Pref	21/—23/-	..	..
2,073,280	Stk.	July 26	7	5	Commercial Ord.	98—101	..	100
475,000	,,	Dec. 20	8	8	Do 8 p.c. Deb.	66—69*	..	..
800,000	,,	Sept. 27	11	11	Continental Union, Ltd.	112—117	+7	105—112½
200,000	,,	,,	7	7	Do. 7 p.c. Pref.	108—110	+3	..
787,560	,,	Aug. 16	7	7	Croydon sliding scale	110—113	..	..
403,100	,,	,,	5	5	Do. max. div.	84—87	..	..
492,270	,,	Aug. 16	10	7	Derby Con.	115—120e	..	..
55,000	,,	Dec. 20	4	4	Do. Deb.	70—72e*	..	..
209,000	,,	Aug. 30	5	5	East Hull Ord. 5 p.c.	75—78	..	..
1,002,180	10	Sept. 13	16	14	European, Ltd.	10—10½	+½	9⅞—10⅝
18,708,480	Stk.	July 26	5/1/4	5½	Gas Light & Coke 4 p.c. Ord.	18/1¼—18/7½f	..	18/1⅛—18/7½
2,600,000	,,	,,	8½	8½	Do. 8½ p.c. max.	62—65	..	63⅜
4,187,020	,,	,,	4	4	Do. 4 p.c. Con. Pref.	78—81	..	79½
5,602,620	,,	Dec. 20	3	3	Do. 3 p.c. Con. Deb.	59—61*	..	59
181,315	,,	,,	6	6	Do. 6 p.c. Br'tf'd Rd. Db.	102—105*	..	..
1,642,770	,,	,,	5	5	Do. 5 p.c. Red. Deb.	98—100*	..	..
42,000	,,	—	7½	7½	Do. 7½ p.c. Ilford Deb.	..	..	..
82,500	,,	Aug. 30	6⅔	7	Hastings & St L. 5 p.c. Conv	95—100	..	..
268,740	,,	,,	5⅔	5⅔	Do. 3½ p.c. Conv.	75—80	..	..
70,000	10	Oct. 11	†10	†10	Hongkong & China, Ltd.	13—14	..	..
173,200	Stk.	Aug. 30	5	5½	Hornsey Con. 5½ p.c.	88—91	..	..
1,976,000	,,	Nov. 8	10	10	Imperial Continental Cap.	210—220	+15	195—219
228,180	,,	Aug. 16	8½	8½	Do. 8½ p.c. Red. Deb.	67—69	..	..
235,242	,,	Aug. 16	7	7½	Lea Bridge 6 p.c. Ord.	116—121	..	..
2,145,907	,,	Aug. 16	5½	5½	Liverpool 5 p.c. Ord.	90½—91b	..	..
600,000	,,	Sept. 27	7	7	Do. 7 p.c. Red. Pref.	101—102b	..	..
165,736	,,	Aug. 16	8	9	Maidstone 5 p.c. Cap.	124—129	..	..
63,480	,,	Dec. 20	3	3	Do. 3 p.c. Deb.	54—57*	..	..
75,000	5	Dec. 6	18	18	Malta & Mediterranean	5½—6	+¼	..
392,000	—	—	—	—	Metrop't'n (of Melbourne) 5½ p.c. Red. Deb.	99—101	..	101—101¼
641,920	Stk	Nov. 22	†7	†5	Montevideo, Ltd.	95—97	..	96½—97
2,061,315	,,	Aug. 16	5	5	Newcastle & Gateshead Con.	16/9—17/3df	..	..
360,929	,,	,,	4	4	Do. 4 p.c. Pref.	71½—72½d	..	..
691,705	,,	Dec. 20	8½	8A	Do. 8½ p.c. Deb.	68—69d*	..	..
131,780	,,	Aug. 30	6/18/0	7/1 0	North Middlesex 6 p.c. Con.	102—107	..	..
800,000	,,	Nov. 22	7	9	Oriental, Ltd.	112—115	..	..
188,120	,,	Dec. 20	7½	8	Plym'th & Ston'house 5 p.c.	108—111*	..	..
414,500	,,	Aug. 30	7½	7½	Portsm'th Con. Stk. 4p.c. Std.	109—112	..	..
236,732	,,	,,	5	5	Do. 5 p.c. max.	79—82	..	..
3,334,464	1	—	—	—	Primitiva Ord.	25/6—27/6	..	26/3—27/-
244,500	100	Dec. 8	4	4	Do. 4 p.c. Red. Deb.	91—94	..	92½
695,000	Stk.	July 26	4	4	Do. 4 p.c. Red. Deb. 1911	79—81	..	..
416,345	,,	Dec. 20	4	4	Do. 4 p.c. Cons. Deb.	78—80*	..	..
150,000	10	Sept. 27	6	6	San Paulo 6 p.c. Pref.	8½—8⅝	..	..
1,796,968	Stk.	Aug. 30	—	—	Sheffield Cons.	104—106e	..	..
95,000	,,	July 12	—	—	Do. 4 p.c. Deb.	75—77e	..	..
90,000	10	June 14	‡3	‡4	South African	4—6	..	..
6,609,895	Stk.	July 26	7½	5	South Met. Ord.	106½—108½	..	107—107⅞
500,000	,,	,,	6	6	Do. 6 p.c. Irred. Pf.	110—113	..	..
1,895,445	,,	July 12	3	3	Do. 3 p.c. Deb.	59—61	..	60—61¾
784,000	,,	Sept 13	6½	6½	Do. 6½ p.c. Red. Db.	100—102	..	..
91,500	,,	Aug. 16	8½	8½	South Shields Con.	109—110d	..	..
1 243,795	,,	July 26	6½	6½	South Suburban Ord. 6 p.c.	108—111	..	..
868,837	,,	Dec. 20	5	5	Do. 5 p.c. Deb.	97—100*	+1	97½—100
647,740	,,	Aug. 30	5	5	South'mpton Ord. 5 p.c. max	77—79	..	78⅜
121,275	,,	Dec. 20	4	4	Do. 4 p.c. Deb.	71—74*	..	73—74
250,000	,,	Aug. 30	7	7	Swansea 7 p.c. Red. Pref.	101—103	..	..
200,000	,,	Dec. 20	6½	6½	Do. 6½ p.c. Red. Deb.	99—101*	..	..
120,000	,,	July 26	7½	8	Tottenham District A 5 p.c.	..	..	..
882,275	,,	,,	6½	6½	Do. B 8½ p.c.	101—104	+1	102—103½
150,000	,,	,,	6½	6½	Do. 5½ p.c. Pref.	96—99	..	..
181,255	,,	Dec. 6	4	4	Do. 4 p.c. Deb.	75—78	..	76½
289,094	,,	Aug. 30	6⅝	6⅝	Uxbridge, Maidenhead, & Wycombe 5 p.c.	93—98	..	..
88,380	,,	,,	5	5	Do. 5 p.c. pref.	87—92	..	..
80,000	,,	July 12	8½	6½	Wandsworth, Wimbledon, and Epsom— Wandsworth A 5 p.c.	130—135	..	..
256,686	,,	,,	7	7½	Do. B 8½ p.c.	113—118	..	..
132,535	,,	,,	6/19/0	6½	Do. C and New	99—104	..	..
382,000	,,	,,	6⅔	6⅔	Do. Wimbledon 5 p.c.	107—112	..	..
98,000	,,	,,	7⅜	7⅜	Do. Epsom 5 p.c.	117—122	..	..
200,000	,,	,,	5	5	Do. 5 p.c. Pref.	88—91	..	..
83,416	,,	Dec. 20	3	3	Do. 3 p.c. Deb.	£6—59*	..	..
284,743	,,	,,	4	4	Do. 4 p.c. Deb.	75—78*	..	..
207,500	,,	,,	5	5	Do. 5 p.c. Deb.	96—98*	..	..

Quotations at:—*a.*—Bristol. *b.*—Liverpool. *c.*—Nottingham. *d.*—Newcastle. *e.*—Sheffield. *f.*—The quotation is per £1 of Stock. * Ex. div. † Paid free of income-tax. ‡ For year.

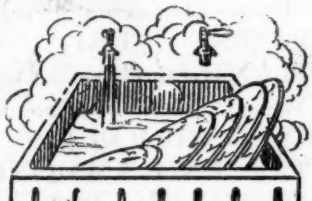
(CORRECTION :—The transactions for the year 1928 recorded in the Table of last week's issue in respect of the European Gas Company should read 7½—10.)

HOT WATER INSTANTLY NIGHT OR DAY for ANY PURPOSE



Hot bath in 5 minutes, early or late—Just turn the tap.—EWART'S GEYSERS.

Hot water is instantly available "a.m. or p.m." in the bedroom—Just turn the tap.—EWART'S GEYSERS.



In the kitchen hot water is always wanted; if instantly obtained it "helps things."

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